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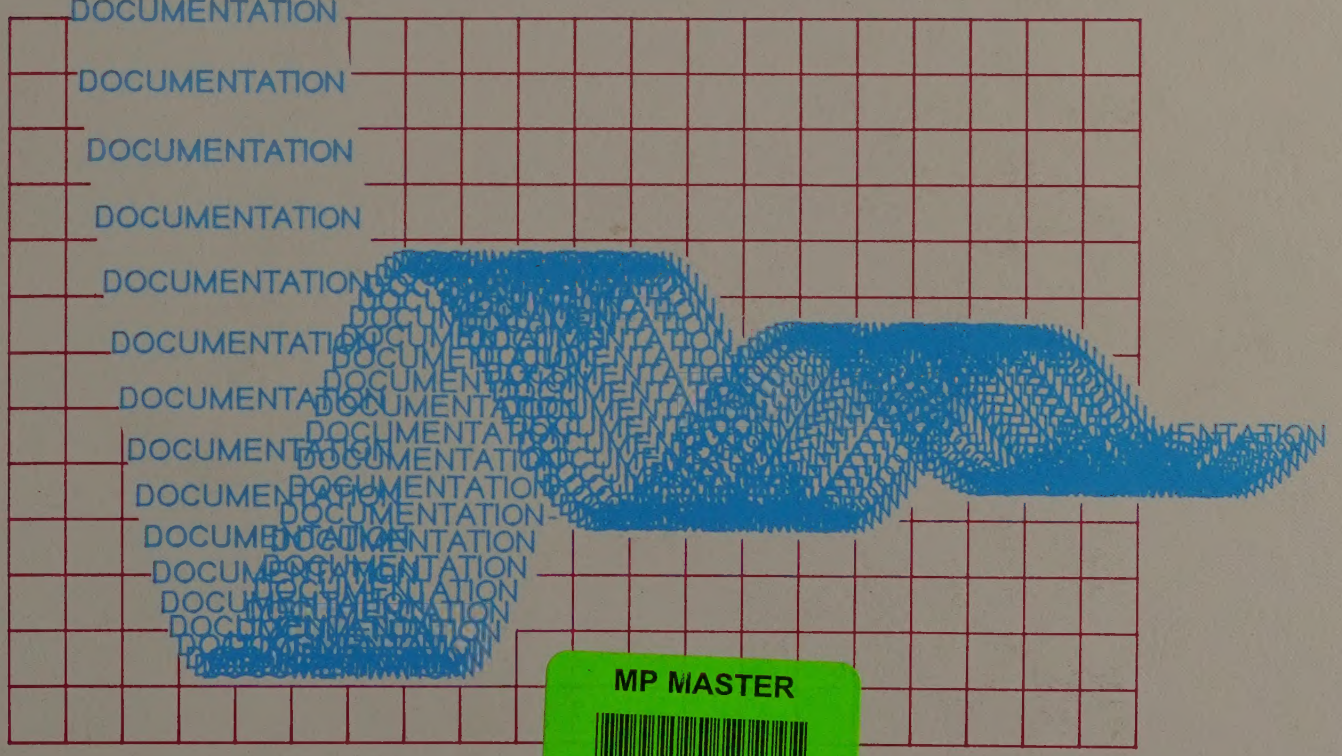
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Test and Measurement
Division

Operating Manual

3GPP WCDMA Mobile Station Test

Application Firmware Module FSIQK73

1153.1009.02

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Republic of Germany

Measurement
Setup for Multi-Station Tests
Channel Configuration
Trigger
Measurement
Setup for Multi-Station Tests
Start
Preset

Contents

Safety Instructions
Certificate of Quality
Support Center Address
List of R&S Representatives

Contents of Application Firmware FSIQK73 Manual

3GPP WCDMA Mobile Station Test - Application Firmware FSIQK73 1

1 Enabling the Firmware Option 1

2 Getting Started 2

Basic Settings in Code Domain Measurement Mode 3
Measurement 1: Measuring the Signal Power 3
Measurement 2: Measurement of DPCCH in Vector Signal Analyzer Mode 4
Setting: Synchronizing the reference frequencies 4
Measurement 3: Measurement of Relative Code Domain Power 5
Setting: Behaviour with Deviating Center Frequency Setting 6
Setting: Behaviour with Incorrect Scrambling Code 6
Measurement 4: Triggered Measurement of Relative Code Domain Power 7
Setting: Trigger offset 7
Measurement 5: Measurement of Modulation Accuracy 8
Measurement 6: Measurement of Peak Code Domain Errors 9

3 Setup for Mobile Station Tests 10

Standard Test Setup 10
Presetting 11

4 Channel Configuration 12

5 Menu Overview 13

6 Configuration of WCDMA Measurements 15

Measurement of Channel Power 16
Measurement of Adjacent-Channel Power - ACLR 17
Signal Power Check – SPECTRUM EM MASK 18
Measurement of Occupied Bandwidth - OCCUPIED BANDWIDTH 20
Spectrum Measurement - SPECTRUM 21
Measurement of Crest Factor - TIME DOMAIN 22
Signal Statistics - CCDF 24
Code Domain Measurements on WCDMA Signals 26
Continuous Measurement - Continuous Sweep 27
Single Measurement - Single Sweep 27
Display Mode - RESULT DISPLAY 28
Measurement Configuration 43
MARKER Functions 47
Configuration of CDP Measurement – MEAS SETTINGS 48
Level Settings – REV LEVEL 51
Automatic Adaptation to Input Level - LEVEL AUTO ADJUST 51
Automatic Setting of CDP Measurement Mode - CDP AUTO ADJUST 52
TRACE Key Group 53

7 Remote Control via Commands ... 7-1

Trace Settings - TRACE Key Group 53
Overview of Other Menus 59
SYSTEM Key Group 59
CONFIGURATION Key Group 59
FREQUENCY Key Group 59
LEVEL Key Group, INPUT Key 59
MARKER Key Group 59
LINES Key Group 59
SWEEP Key Group 60
HCOPY and MEMORY Key Group 60

7 Remote-Control Commands 61
CALCulate Subsystem 61
CALCulate:STATistics - Subsystem 64
CONFigure:WCDPower Subsystem 65
INSTrument Subsystem 67
SENSe:CDPower Subsystem 68
TRACe Subsystem 70
Alphabetical List of Commands 72
Table of Softkeys with Assignment of IEC/IEEE Commands 73
CONFIGURATION Key Group 73
STATus QUEStionable:SYNC Register 77

8 Performance Test 78
Required Measuring Equipment and Accessories 78
Test Procedure 78
Performance Test Report 81

9 Glossary 82

10 Index 83

Fig. 5-1 Overview of the R&S CDMA2000 Key Group 59
Fig. 5-2 Overview of menus – CODE DOMAIN 60
Fig. 5-3 Overview of menus in the BASE STATION 62
Fig. 5-4 Overview of menus in the MOBILE STATION 63
Fig. 5-5 Overview of menus in the SPECTRUM 64
Fig. 5-6 Overview of menus in the MEASURE 65
Fig. 5-7 Overview of menus in the SYSTEM 66
Fig. 5-8 Overview of menus in the FILE 67
Fig. 5-9 Overview of menus in the PRINT 68
Fig. 5-10 Overview of menus in the HELP 69
Fig. 5-11 Overview of menus in the SETUP 70
Fig. 5-12 Overview of menus in the MARKER 71
Fig. 5-13 Overview of menus in the MARKER FCT 72
Fig. 5-14 Overview of menus in the MARKER PEAK 73
Fig. 5-15 Overview of menus in the MARKER SEARCH 74
Fig. 5-16 Overview of menus in the MARKER TRACE 75
Fig. 5-17 Overview of menus in the MARKER MODE 76
Fig. 5-18 Overview of menus in the MARKER DELTA 77
Fig. 5-19 Overview of menus in the MARKER DELTA FCT 78
Fig. 5-20 Overview of menus in the MARKER DELTA PEAK 79
Fig. 5-21 Overview of menus in the MARKER DELTA SEARCH 80
Fig. 5-22 Overview of menus in the MARKER DELTA TRACE 81
Fig. 5-23 Overview of menus in the MARKER DELTA MODE 82

Figures

Fig. 3-1 MS test setup 10

Fig. 5-1 Overview of menus 13
Fig. 5-2 Overview of menus – CODE DOM POWER 14
Fig. 6-1 Power measurement in the 3.84 MHz transmission channel 16
Fig. 6-2 Adjacent-channel power measurement of a WCDMA mobile station. 17
Fig. 6-3 Measurement of spectrum emission mask. 18
Fig. 6-4 Measurement of occupied bandwidth 20
Fig. 6-5 Spectrum display of WCDMA signal at a 25 MHz span. 21
Fig. 6-6 Time domain display of WCDMA signal. 22
Fig. 6-7 CCDF of WCDMA signal 24
Fig. 6-8 Indication of measurement parameters 29
Fig. 6-9 CDP diagram (relative scaling) 30
Fig. 6-10 Code domain power display mode with absolute scaling 31
Fig. 6-11 Overview display 32
Fig. 6-12 Zoomed representation of the CDP diagram 33
Fig. 6-13 Modulation Accuracy 34
Fig. 6-14 Peak Code Domain Error 35
Fig. 6-15 Power versus Slot measurement for a channel with power control 36
Fig. 6-16 Result Summary 37
Fig. 6-17 Channel Table 39
Fig. 6-18 Symbol Constellation Diagram, I mapping 40
Fig. 6-19 Symbol Constellation Diagram, Q mapping 40
Fig. 6-20 Error Vector Magnitude for the selected slot of the selected channel 41
Fig. 6-21 Demodulated bits for the selected slot of the selected channel 41
Fig. 6-22 Table for editing a channel configuration 44
Fig. 6-23 Parameters of the marker info field 47

Tables

Table 2-1 Default settings of the code domain measurement 3

Table 4-1 Channel configuration 1: DPCCH and 1 DPDCH 12
Table 4-2 Channel configuration 2: DPCCH to 6 DPDCH 12

Table 7-1 Meaning of bits in STATus:QUEStionable:SYNC register 77

Table 8-1 Required Measuring Equipment and Accessories 78
Table 8-2 Performance Test Report 81

Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

Safety-related symbols used on equipment and documentation from R&S:

Observe operating instructions

Weight indication for units >18 kg

PE terminal

Ground terminal

Danger! Shock hazard

Warning! Hot surfaces

Ground

Attention! Electrostatic sensitive devices require special care

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   IP degree of protection 2X, pollution severity 2 overvoltage category 2, only for indoor use, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

   Unless specified otherwise in the data sheet, a tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.

4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.

   If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

10. Ensure that the connections with information technology equipment comply with IEC950 / EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.

    Keep batteries away from children.

    If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list).

    Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.

    Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. The outside of the instrument is suitably cleaned using a soft, lint-free dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

Certified Quality System

ISO 9001

DQS REG. NO 1954-04

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Contents of Manual for Application Firmware FSIQK73

This manual contains all information on the operation of FSIQ equipped with Application Firmware FSIQK73. It includes operation via menus and the remote-control commands for the 3GPP WCDMA mobile station test.

The manual comprises the data sheet and 10 chapters:

The data sheet	informs on the guaranteed specifications and the firmware characteristics.
Chapter 1	describes how to enable the application firmware module.
Chapter 2	describes typical examples of measurements by means of tests.
Chapter 3	describes the measurement setup for mobile station tests.
Chapter 4	describes possible channel configurations for the mobile station signal.
Chapter 5	gives a schematic overview of the WCDMA control menus.
Chapter 6	contains a detailed description of the possible mobile station test measurements as a reference for manual operation The chapter also presents a list of remote-control commands associated with each function.
Chapter 7	describes all remote-control commands defined for the code domain measurement. An alphabetic list of all remote-control commands and a table of softkeys with the assignment of commands are given at the end of this chapter.
Chapter 8	contains the performance test.
Chapter 9	contains the glossary.
Chapter 10	contains the index of this operating manual.

This manual is a supplement to the FSIQ operating manual. It includes exclusively functions of Application Firmware FSIQK73. For all other descriptions, please refer to the FSIQ operating manual.

3GPP WCDMA Mobile Station Test - Application Firmware FSIQK73

Signal Analyzer FSIQ equipped with Application Firmware FSIQK73 performs code domain power measurements on uplink signals according to standard 3GPP (FDD mode). The application firmware is in line with standard 3GPP (Third Generation Partnership Project) with version release 99. In addition to the code domain measurements prescribed by the standard 3GPP, the application offers measurements with predefined settings in the frequency domain, e.g. power and ACLR measurement.

The following hardware is required for using FSIQ in combination with option FSIQK73:

- Option FSIQB70 – Extended I/Q memory and DSP module
- Module I/Q Demodulator: model index 05 (Order No.: 1066.2520.05)

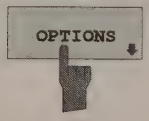
Notes: - *The code domain power measurements can be performed for units fitted with IQ demodulators other than model 05. However, the linearity of the FSIQK73 level values can only be guaranteed with an IQ demodulator of model 05 or higher.*

- *The model index of the I/Q Demodulator is indicated in table "Installed Components" (SYSTEM-INFO HARDWARE+OPTIONS menu)*

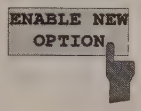
1 Enabling the Firmware Option

Firmware Option FSIQK73 is enabled in the *CONFIGURATION SETUP* menu by entering a keyword. The keyword is delivered with the option. If the option is factory-installed, it is already enabled.

CONFIGURATION SETUP menu:



The *OPTIONS* softkey opens a submenu where keywords for new firmware options (application firmware modules) can be entered. Available options are displayed in a table which is opened when entering the submenu.



The *ENABLE NEW OPTION* softkey activates the entry of the keyword for a firmware option.

One ore several keywords can be entered in the entry field. On entering a valid keyword, *OPTION KEY OK* is displayed on the message line and the option is entered in the *FIRMWARE OPTIONS* table.

The *FIRMWARE OPTIONS* table can be displayed in the *FIRMWARE OPTIONS* softkey in the *INFO* menu.

In case of invalid keywords, *OPTION KEY INVALID* is displayed on the message line.

2 Getting Started

The following chapter explains basic WCDMA mobile station tests by means of a setup with Signal Generator SMIQ. It describes how operating and measurement errors can be avoided using correct presetting.
The measurement screen is presented in chapter 6 for each measurement.

Key settings are shown as examples to avoid measurement errors. Following the correct setting, the effect of an incorrect setting is shown. The following measurements are performed:

- Measurement 1: Measurement of signal power
- Measurement 2: Measurement of DPCCH (Dedicated Physical Common Control Channel) in vector analyzer mode
  - Setting: Synchronization of reference frequencies
- Measurement 3: Measurement of relative code domain power
  - Setting: Setting the analyzer center frequency to the DUT frequency
  - Setting: Scrambling code of signal
- Measurement 4: Triggered measurement of relative code domain power
  -Setting: Trigger offset
- Measurement 5: Measurement of modulation accuracy
- Measurement 6: Measurement of peak code domain error

The measurements are performed using the following units and accessories:

- Signal Analyzer FSIQ with Application Firmware FSIQK73 WCDMA mobile station test (option FSIQB70 required)
- Vector Signal Generator SMIQ with option SMIQB43: digital standard WCDMA (options SMIQB20 and SMIQB11 required)
- 1 coaxial cable, 50 Ω, approx. 1 m, N connector
- 1 coaxial cable, 50 Ω, approx. 1 m, BNC connector

Conventions for displaying settings on FSIQ:

[***<KEY>***]	Press a key on the front panel, e.g. ***[SPAN]***
[<SOFTKEY>]	Press a softkey, e.g. *[MARKER -> PEAK]*
[<nn unit>]	Enter a value and terminate by entering the unit, e.g. *[12 kHz]*

Conventions for displaying settings on SMIQ:

[***<KEY>***]	Press a key on the front panel, e.g. **[FREQ]**
<MENU>	Select a menu, parameter or a setting, e.g. *DIGITAL STD.* The menu level is marked by an indentation.
<nn unit>	Enter a value and terminate by entering the unit, e.g. *12 kHz*

Basic Settings in Code Domain Measurement Mode

In the default setting after PRESET, FSIQ is in the analyzer mode. The following default settings of the code domain measurement are activated, provided the code domain measurement mode is selected.

Table 2-1 Default settings of the code domain measurement

Parameter	Einstellung
Digitaler Standard	W-CDMA 3GPP REV
Sweep	CONTINUOUS
CDP-Modus	CODE CHAN AUTOSEARCH
Triggereinstellung	FREE RUN
Triggeroffset	0.0 s
Scrambling Code	0
Scrambling Code Type	LONG
Threshold value	-10 dB
Symbol-Rate	15 ksps
Code-Nummer	0
Branch	I
Slot-Nummer	0
Darstellart	Screen A: CODE PWR RELATIVE Screen B: RESULT SUMMARY

Measurement 1: Measuring the Signal Power

The measurement of the spectrum gives an overview of the WCDMA signal and the spurious emissions close to the carrier.

Test setup

➢ Connect the RF output of SMIQ to the RF input of FSIQ (coaxial cable with N connectors).

Settings on SMIQ:

[PRESET]
[LEVEL: *0 dBm]*
[FREQ: *2.1175 GHz]*
DIGITAL STD
WCDMA/3GPP
SET DEFAULT
LINK DIRECTION UP/REVERSE
SELECT BS/MS
MS 1 ON
OVERALL SYMBOL RATE OFF
STATE: ON

Settings on FSIQ:

[PRESET]
[CENTER: *2.1175 GHz]*
[REF: *0 dBm]*
[MODE: *3GPP MS MS ANALYZER: POWER]*

Measurement on FSIQ:

The following is displayed:

- The spectrum of the WCDMA signal (DPCCH only) on the trace
- The signal channel power within the 3.84 MHz channel bandwidth (in the marker info field)

Measurement 2: Measurement of DPCCH in Vector Signal Analyzer Mode

When the WCDMA signal only contains one channel, the signal can be measured in the vector analyzer mode of the analyzer. Since each channel is QPSK-modulated after scrambling the total signal is QPSK-modulated also if only one channel is transmitted.
The measurement of the QPSK signal allows, for instance, to determine the frequency offset between DUT and analyzer.
This may be useful for troubleshooting, e.g. if synchronization is not possible during the code domain power measurement.

Test setup *As for measurement 1*

.

Settings on SMIQ: *As for measurement 1*

Settings on FSIQ: ***[PRESET]***
[CENTER: *2.1175 GHz]*
[REF: *0 dBm]*
[MODE: *VECTOR ANALYZER*
DIGITAL STANDARDS *W-CDMA 3GPP REV]*

Measurement on FSIQ: The following is displayed:

- Screen A: Constellation diagram of signal (QPSK)
- Screen B: Numeric results of demodulation

Frequency error The frequency error display denotes the frequency offset between the DUT and the analyzer. For a high frequency offset (> 1 kHz), the CDP measurements are inaccurate and a synchronization of the analyzer and the measurement signal is no longer possible. The frequency offset can be corrected by tuning the transmitter or center frequency of the analyzer. It is recommended to synchronize the analyzer and the DUT via the reference input of the analyzer.

Setting: Synchronizing the reference frequencies

The synchronization of the reference oscillators both of the DUT and analyzer strongly reduces the measured frequency error.

Test setup ➢ Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).

Settings on SMIQ: *As for measurement 2*

Settings on FSIQ: *As for measurement 2, plus*
[SETUP: *REFERENCE EXT]*

Measurement on FSIQ: Frequency error The displayed frequency error should be < 10 Hz.

The reference frequencies of the analyzer and of the DUT should be synchronized

Measurement 3: Measurement of Relative Code Domain Power

A code domain power measurement with one of the possible channel configurations is shown in the following. To demonstrate the effects the basic parameters of CDP measurements which allow an analysis of the signal are changed one after the other from values adapted to the measurement signal to non-adapted values.

Test setup

- Connect the RF output of SMIQ to the input of FSIQ
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).

Settings on SMIQ:

[PRESET]
[LEVEL: 0 dBm]
[FREQ: 2.1175 GHz]
DIGITAL STD
WCDMA 3GPP
LINK DIRECTION UP / REVERSE
TEST MODELS (NOT STANDARDIZED)...
C+D960K
SELECT BS/MS
MS 1 ON
*OVERALL SYMBOL RATE... 6*960*
STATE: ON

Settings on FSIQ:

[PRESET]
[CENTER: 2.1175 GHz]
[REF: 10 dBm]
[MODE: 3GPP MS ANALYZER: CODE DOM POWER
MEAS SETTINGS SCRAMBLING CODE 0]

Measurement on FSIQ: The following is displayed:

Screen A: Code domain power of signal, I component
(channel configuration with 3 data channels in the I branch)

Screen B: Numeric results of CDP measurement

Setting: Behaviour with Deviating Center Frequency Setting

In the following, the behaviour of the DUT and the analyzer with deviating center frequency setting is shown.

Settings on SMIQ: ➢ Tune the center frequency of the signal generator in 1 kHz steps and watch the analyzer screen:

Measurement on FSIQ:
- A CDP measurement on the analyzer is still possible with a frequency error of up to approx. 3 kHz. Up to 3 kHz, a frequency error causes no apparent difference in measurement accuracy of the code domain power measurement.
- Above a frequency error of 3 kHz, the probability of an impaired synchronization increases. With continuous measurements, at times all channels are displayed in blue with almost the same level.
- Above a frequency error of approx. 4 kHz, a CDP measurement cannot be performed. FSIQ displays all possible codes in blue with a similar level.

Settings on SMIQ: ➢ Set the signal generator center frequency again to 2.1175 GHz:
[FREQ: *2.1175 GHz]*

The analyzer center frequency should not differ from the DUT frequency by more than 3 kHz.

Setting: Behaviour with Incorrect Scrambling Code

A valid CDP measurement can only be carried out if the scrambling code set on the analyzer is identical to the one of the transmitted signal.

Test setup *SELECT BS/MS*
MS 1: ON
SCRAMBLING CODE: 0001
(the scrambling code is set to 0000 on the analyzer)

Settings on SMIQ: The CDP display shows all possible codes with approximately the same level.

Settings on FSIQ: Set scrambling code to new value:
[MODE: *3GPP MS ANALYZER: CODE DOM POWER*
MEAS SETTINGS *SCRAMBLING CODE 1]*

Measurement on FSIQ: The CDP display again shows the channel configuration.

The scrambling code setting of the analyzer must be identical to that of the measured signal.

Measurement 4: Triggered Measurement of Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of approximately 20 ms of the test signal is recorded at an arbitrary moment to detect the start of a WCDMA frame in this section. Depending on the position of the frame start, the required computing time can be quite long (up to approx. 5 seconds). This can be reduced by applying an external (frame) trigger.

Test setup

- Connect the RF output of SMIQ to the input of FSIQ
- Connect the reference input (EXT REF IN/OUT) on the rear panel of FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ: *As for measurement 3*

Settings on FSIQ: *As for measurement 3, plus*
[MEAS SETTINGS TRIGGER EXT]

Measurement on FSIQ: The following is displayed:
Screen A: Code domain power of signal, I component
(channel configuration with 3 data channels in the I branch)
Screen B: Numeric results of CDP measurement

Trg to Frame: Offset between trigger event and start of WCDMA frame

The repetition rate of the measurement increases considerably compared to the repetition rate of a measurement without external trigger.

Setting: Trigger offset

A delay of the trigger event referred to the start of the WCDMA frame can be compensated by modifying the trigger offset.

Settings on FSIQ: ***[MODE:*** *3GPP MS ANALYZER: CODE DOM POWER*
MEAS SETTINGS *EXT TRIG OFFSET* *100 µs]*

Measurement on FSIQ: The parameter Trg to Frame in the numeric results table (screen B) changes:
Trg to Frame *-100 µs*

A trigger offset compensates analog delays of the trigger event.

Measurement 5: Measurement of Modulation Accuracy

The modulation accuracy measurement defined by the 3GPP specifications represents a measurement of the RMS-averaged deviation of the test signal from the ideal signal.
An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The square deviation yields the modulation accuracy.

Test setup

- Connect the RF output of SMIQ to the input of FSIQ
- Connect the reference input (EXT REF IN/OUT) on the rear panel of FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ:

[PRESET]
[LEVEL: *0 dBm]*
[FREQ: *2.1175 GHz]*
DIGITAL STD
WCDMA 3GPP
LINK DIRECTION UP / REVERSE
TEST MODELS (NOT STANDARDIZED)...
C+D960K
SELECT BS/MS
MS 1 ON
*OVERALL SYMBOL RATE... 6*960*
STATE: ON

Settings on FSIQ:

[PRESET]	
[CENTER:	*2.1175 GHz]*
[REF:	*10 dBm]*
[MODE:	*3GPP MS ANALYZER: CODE DOM POWER*
MEAS SETTINGS	*SCRAMBLING CODE 0*
	SCR TYPE LONG
	INACT CHAN THRESHOLD -10
	TRIGGER EXT
[menu change key UP]	
RESULT DISPLAY	*MODULATION ACCURACY]*

Measurement on FSIQ: The following is displayed:

Screen A: Code domain power of signal, I component (channel configuration with 3 active channels in the I branch)

Screen B: Modulation accuracy (EVM for total signal)

Measurement 6: Measurement of Peak Code Domain Errors

The peak code domain error measurement is defined in the 3GPP specification for WCDMA signals. An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The difference of the two signals is projected onto the classes of the different spreading factors. The peak code domain error measurement is obtained by summing up the symbols of each difference signal slot.

Test setup

- Connect the RF output of SMIQ to the input of FSIQ
- Connect the reference input (EXT REF IN/OUT) on the rear panel of FSIQ to the reference input (REF) on the rear panel of SMIQ (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of FSIQ (EXT TRIG GATE) to the external trigger output on the rear panel of SMIQ (TRIGOUT1 of PAR DATA).

Settings on SMIQ:

[PRESET]
[LEVEL: *0 dBm]*
[FREQ: *2.1175 GHz]*
DIGITAL STD
WCDMA 3GPP
LINK DIRECTION UP / REVERSE
TEST MODELS (NOT STANDARDIZED)...
C+D960K
SELECT BS/MS
MS 1 ON
*OVERALL SYMBOL RATE... 6*960*
STATE: ON

Settings on FSIQ:

[PRESET]	
[CENTER:	*2.1175 GHz]*
[REF:	*0 dBm]*
[MODE:	*3GPP MS ANALYZER: CODE DOM POWER*
MEAS SETTINGS	*SCRAMBLING CODE 0*
	SCR TYPE LONG
	INACT CHAN THRESHOLD -20
	TRIGGER EXT
[menu change key UP]	
RESULT DISPLAY	*PEAK CODE DOMAIN ERR*
	SELECT PCDE SF 256]

Measurement on FSIQ: The following is displayed:

Screen A: Code domain power of signal, I component (channel configuration with 3 active channels in the I branch)

Screen B: Peak code domain error (projection of the error onto the class with spreading factor 256)

3 Setup for Mobile Station Tests

Caution:

Before turning the instrument on, the following conditions must be fulfilled:

- *Instrument covers are in place and all fasteners are tightened.,*
- *Fan openings are free from obstructions.*
- *Signal levels at the input connectors are all below specified maximum values. The level at the FSIQ RF input of +20 dBm with a 0 dB input attenuator must under no circumstances be exceeded.*
- *Signal outputs are correctly connected and not overloaded.*

Non-compliance with these instructions may cause damage to the instrument .

This section describes how to set up the analyzer for WCDMA mobile station tests. As a prerequisite for starting the test, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the operating manual for the analyzer. Furthermore, the application firmware module must be properly installed following the instructions given in chapter 1 of the present manual.

Standard Test Setup

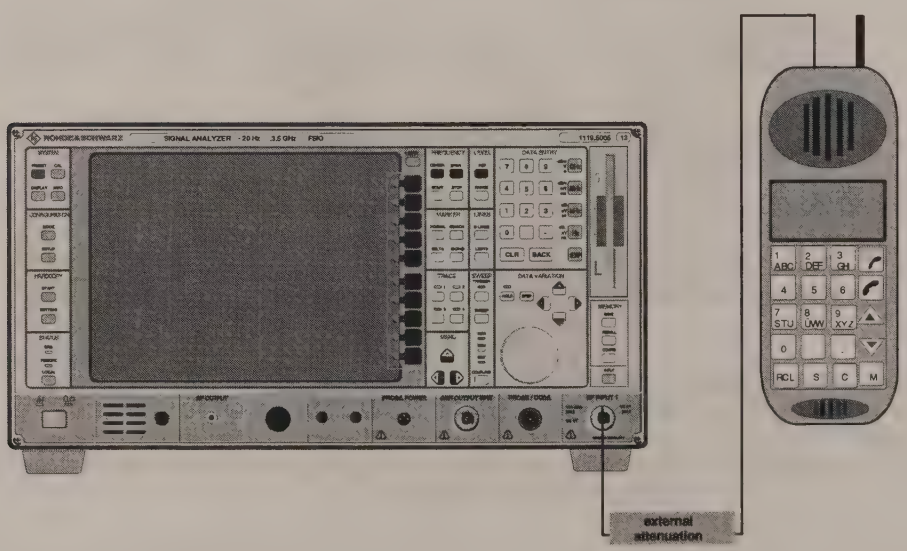


Fig. 3-1 MS test setup

➢ Connect antenna output of MS to RF input of the analyzer via a power attenuator of suitable attenuation.

The following values are recommended for the external attenuator to ensure that the RF input of the analyzer is protected and the sensitivity of the analyzer is not reduced too much.

Max. power	Recommended ext. attenuation
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	5 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
< 20 dBm	0 dB

Presetting

- Enter external attenuation (reference level offset)
- Enter reference level
- Enter center frequency
- Select standard and measurement

4 Channel Configuration

The possible channel configurations for the mobile station signal are limited by 3GPP. Only two different configurations are permissible according to the specification. For this reason, the FSIQK73 checks for these two channel configurations only once during the automatic channel search. Therefore, channels whose parameters do not correspond to one of these configurations are not automatically detected as active channels.

The two possible channel configurations are summarized below:

Table 4-1 Channel configuration 1: DPCCH and 1 DPDCH

Channel type	Number of channels	Symbol rate	Spreading code(s)	Mapping to component
DPCCH	1	15 ksps	0	Q
DPDCH	1	15 ksps – 960 ksps	[Spreading-Faktor / 4]	I

Table 4-2 Channel configuration 2: DPCCH to 6 DPDCH

Channel type	Number of channels	Symbol rate	Spreading code(s)	Mapping to component
DPCCH	1	15 ksps	0	Q
DPDCH	1	960 ksps	1	I
DPDCH	1	960 ksps	1	Q
DPDCH	1	960 ksps	3	I
DPDCH	1	960 ksps	3	Q
DPDCH	1	960 ksps	2	I
DPDCH	1	960 ksps	2	Q

5 Menu Overview

Application Firmware Module FSIQK73 (WCDMA mobile station test) extends the analyzer by the code domain measurement mode for 3GPP WCDMA standard. Additional softkeys are available which allow overview measurements in the analyzer and vector analyzer modes.

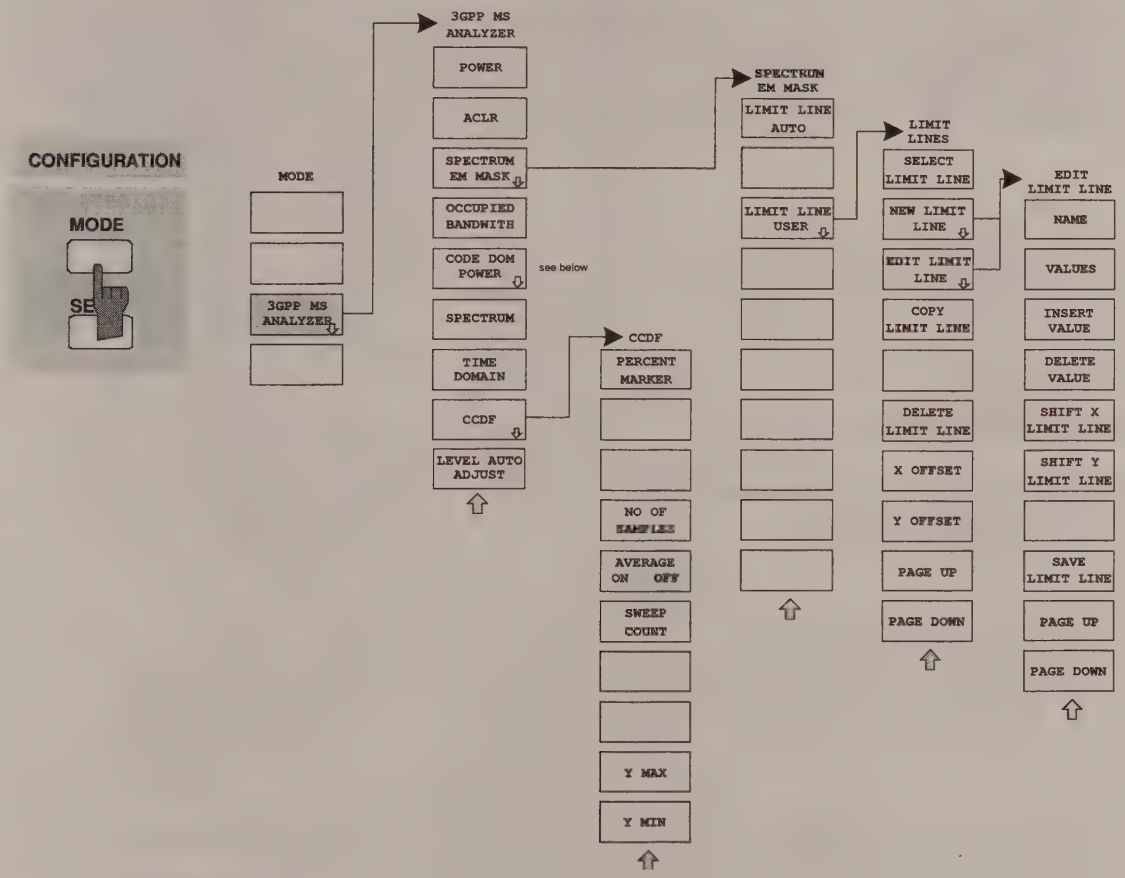


Fig. 5-1 Overview of menus

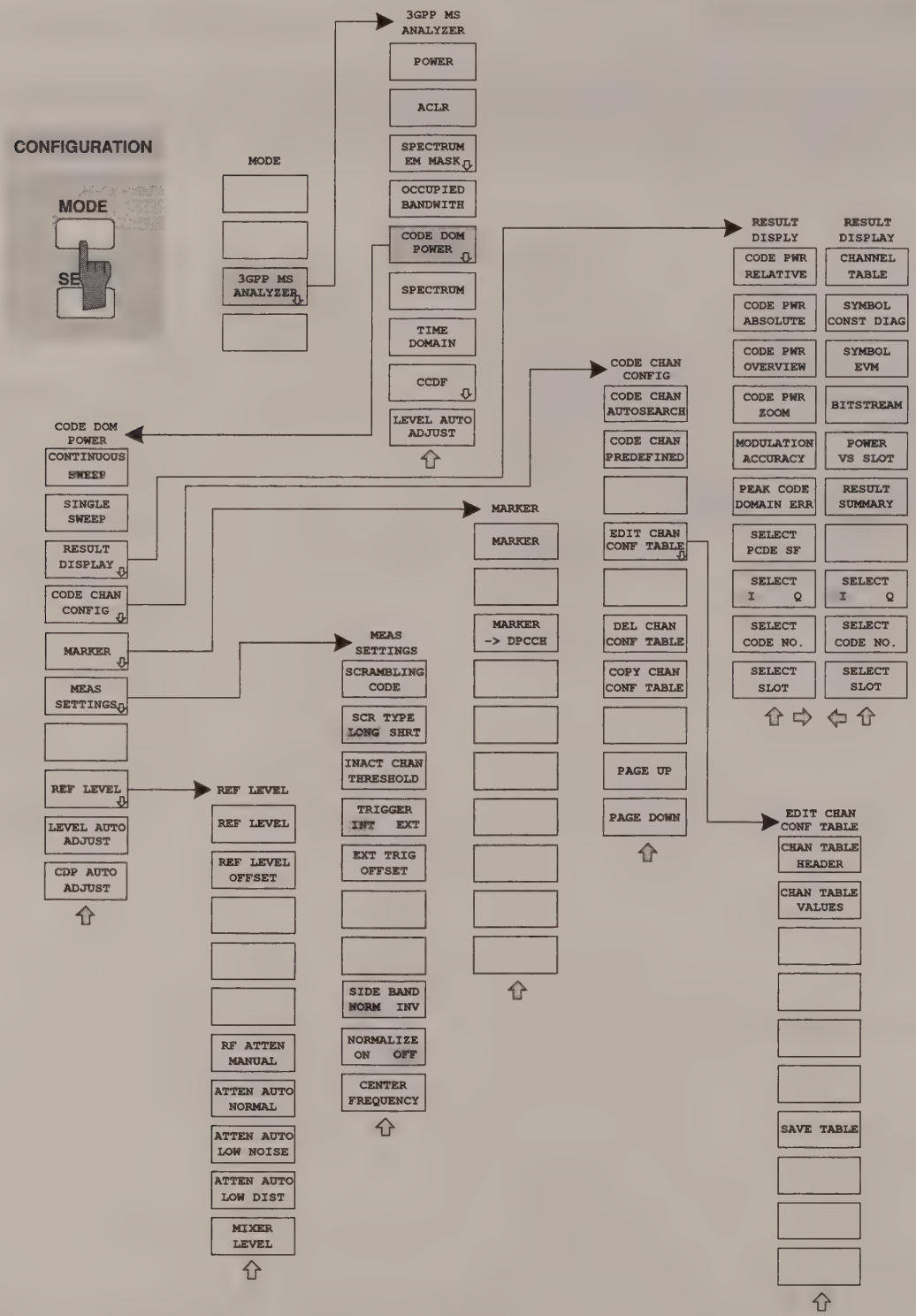


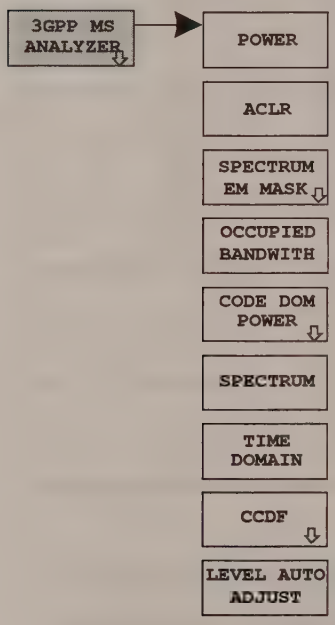
Fig. 5-2 Overview of menus – CODE DOM POWER

6 Configuration of WCDMA Measurements

The most important parameters for the 3GPP WCDMA mobile station tests are summarized in the menu *cdmaOne MS* (*CONFIGURATION* key group, *Mode* key) and are explained below using the softkey functions.

The *CDP MEAS* softkey activates the code domain measurement mode and opens the submenus for setting the measurement.
The softkeys *POWER*, *ACLRSPECTRUM EM MASK*, *OCCUPIED BANDWIDTH*, *SPECTRUM* and *TIME DOMAIN* and OCDF activate mobile station tests in the analyzer or vector analyzer mode. The settings required by 3GPP specifications are performed by pressing the associated softkey, a subsequent modification of settings is possible. The other menus of FSIQ correspond to the menus of these modes and are described in the operating manual of FSIQ.

*CONFIGURATION MODE m*enu

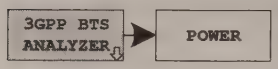


The *3GPP MS ANALYZER* softkey opens a submenu for setting the various measurement modes of option FSIQK73:

- *POWER* activates the channel power measurement with defined settings in the analyzer mode.
- *ACLR* activates the adjacent channel power measurement with defined settings in the analyzer mode.
- *SPECTRUM EM MASK* compares the signal power in different carrier offset ranges with the maximum values specified by 3GPP.
- *OCCUPIED BANDWIDTH* activates the measurement of the occupied bandwidth (analyzer mode).
- *CODE DOM POWER* activates the code domain measurement mode and opens another submenu for selecting and configuring the parameters. All other menus of FSIQ are adapted to the functions of the code domain measurement mode.
- *SPECTRUM* activates an overview measurement with defined settings in the analyzer mode.
- *TIME DOMAIN* activates the measurement of the WCDMA signal CREST factor in the time domain display mode (analyzer mode).
- *CCDF* evaluates the signal with regard to its statistical characteristics (distribution function of the signal amplitudes).

Measurement of Channel Power

Submenu: *CONFIGURATION- MODE – 3GPP MS ANALYZER – POWER*



The *POWER* softkey activates the measurement of the WCDMA signal channel power.

FSIQ measures the RF signal power in the 3.84 MHz bandwidth. The power is calculated by summing up the values at the trace points. The individual trace points are weighted with the root raised cosine function as specified by the 3GPP standard. The bandwidth is displayed numerically in the marker info field at the top right edge of the screen.

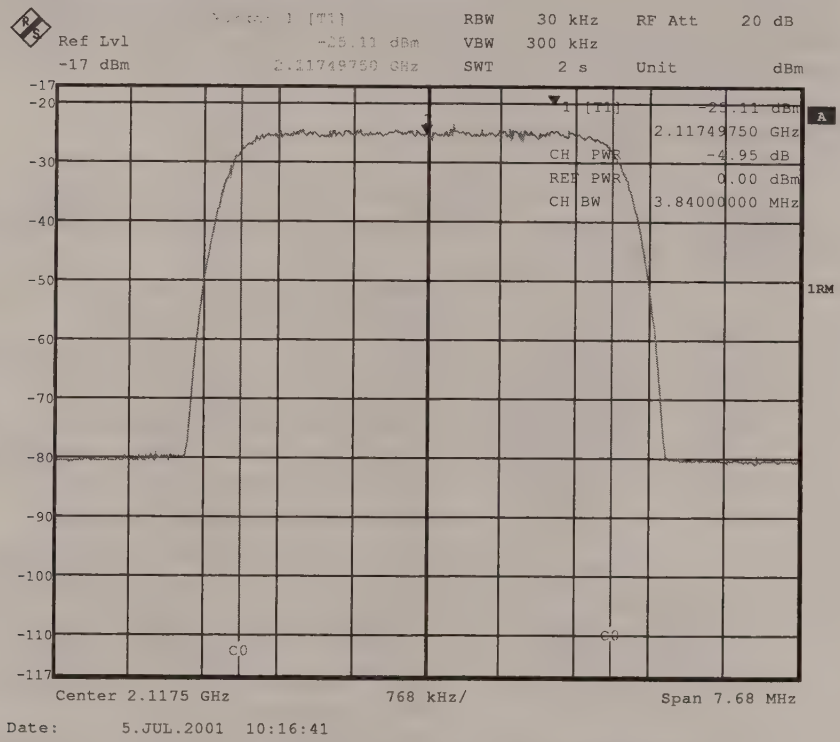


Fig. 6-1 Power measurement in the 3.84 MHz transmission channel

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:	Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
MARKER NORMAL	CHANNEL POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP REV

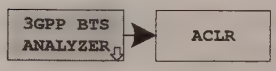
Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement POWer`

Query of results: `:CALCulate:MARKer:FUNCtion:POWer:RESult? CPOWer`

Measurement of Adjacent-Channel Power - ACLR

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER*



The ACLR softkey activates the adjacent-channel power measurement in the default setting according to 3GPP specifications (Adjacent Channel Leakage Power Ratio).
FSIQ measures the channel power and the relative power of adjacent channels and of the next channels. The results are displayed in the marker info field at the top right edge of the screen.

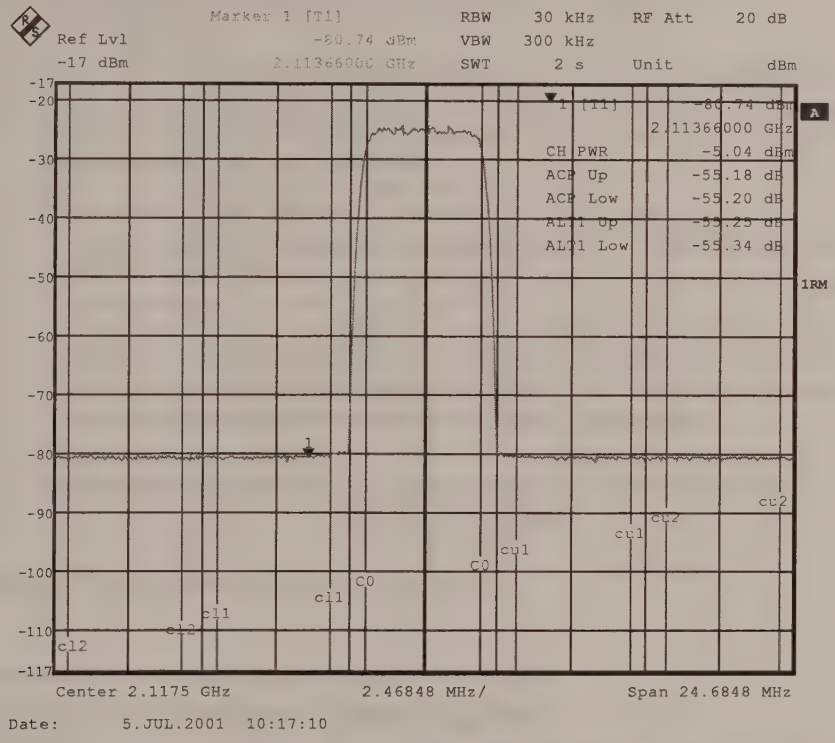


Fig. 6-2 Adjacent-channel power measurement of a WCDMA mobile station.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:	Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings	
MARKER NORMAL	ADJACENT CHAN POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP REV
	SET NO OF ADJ CHAN'S	2

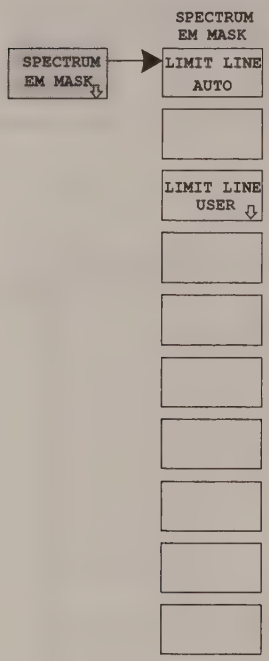
Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement ALCR`

Query of results: `:CALCulate:MARKer:FUNCtion:POWer:RESult? ACPower`

Signal Power Check – SPECTRUM EM MASK

CONFIGURATION - MODE - 3GPP MS ANALYZER submenu



The *SPECTRUM EM MASK* softkey starts the determination of the power of the WCDMA signal in defined offsets from the carrier and compares the power values with a spectral mask specified by 3GPP.

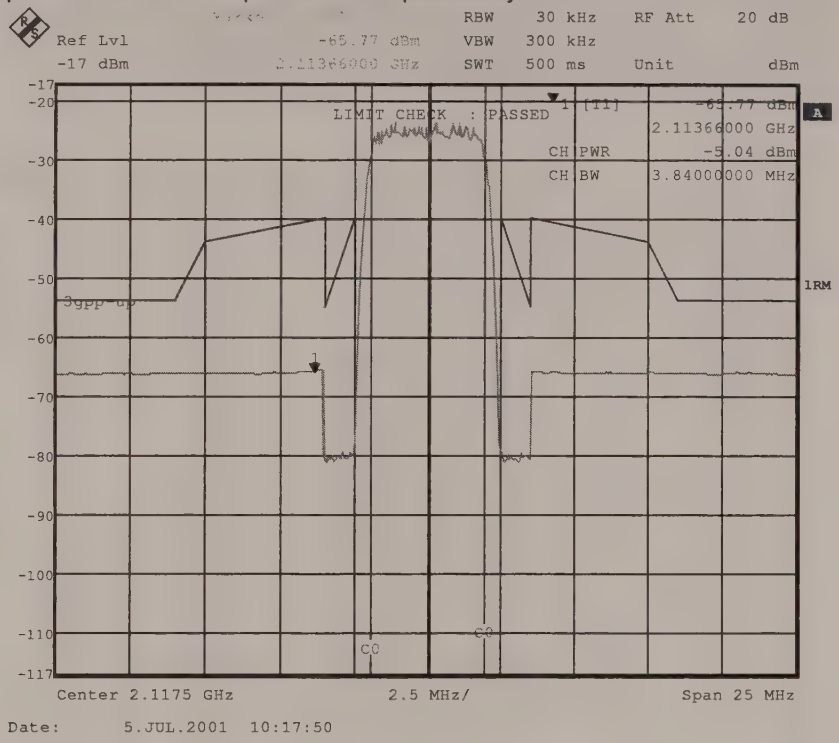


Fig. 6-3 Measurement of spectrum emission mask.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings		
MARKER NORMAL	CHANNEL POWER	
MARKER NORMAL	POWER MEAS SETTINGS - ACP STANDARD	W-CDMA 3GPP REV
	SET NO OF ADJ CHAN'S	0

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement ESPectrum`

Query of results: `:CALCulate:LIMit:FAIL?` and visual evaluation

The *LIMIT LINE AUTO* softkey automatically selects the limit line to be checked according to power determined in the useful channel. If the measurement is carried out in *CONTINUOUS SWEEP* and the channel power changes from sweep to sweep, this can result in the limit line being continuously redrawn.
The softkey is activated when the spectrum emission mask measurement is entered.

IEC/IEEE-bus command: `:CALC:LIM:ESP:MODE AUTO`

The *LIMIT LINE USER* softkey activates the input of user-defined limit lines. The softkey opens the menus of the limit line editor that are known from the basic unit. The limit lines created by the user are included in the table for *LIMIT LINE MANUAL*.

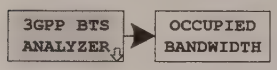
The following limit line settings are useful for mobile station tests:
Trace 1, Domain Frequency, X-Scaling relative, Y-Scaling absolute, Spacing linear, Unit dBm

In contrast to the predefined limit lines supplied with the FSIQ which correspond to the standard specifications, the user-defined limit line can be specified for the entire frequency range (±12.5 MHz from carrier) either relatively (referred to the channel power) or absolutely.

IEC/IEEE-bus command: see Table of Softkeys with Assignment of IEC/IEEE Commands

Measurement of Occupied Bandwidth - OCCUPIED BANDWIDTH

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER*



The *OCCUPIED BANDWIDTH* activates the measurement of the bandwidth which the signal occupies.
The occupied bandwidth is defined as the bandwidth in which 99% of the total transmitter power is contained.
The occupied bandwidth and the frequency markers are output in the marker info field at the top right edge of the screen.

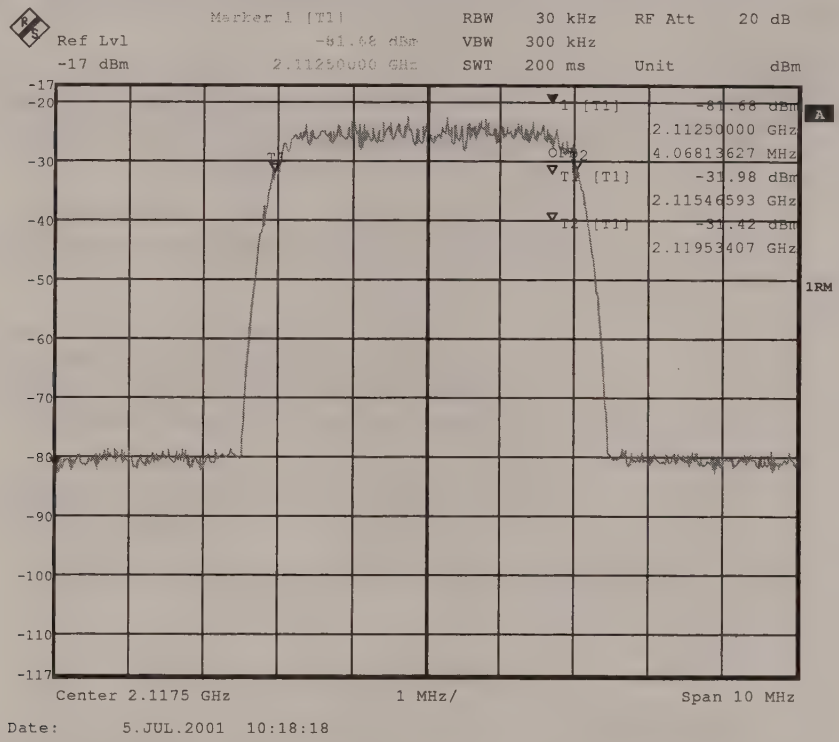


Fig. 6-4 Measurement of occupied bandwidth.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings		
MARKER NORMAL	OCCUPIED PWR BANDW	
FREQUENCY SPAN	CENTER FIXED	10 MHz
SWEEP SWEEP	SWEEP TIME MANUAL	0.2 sec
SWEEP COUPLING	RBW MANUAL	30 kHz
TRACE 1	DETECTOR	RMS

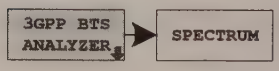
Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement OBANdwidth`

Query of results: `:CALCulate:MARKer:FUNCtion:POWer:RESult? OBANdwidth`

Spectrum Measurement - SPECTRUM

Submenu: *CONFIGURATION- MODE - 3GPP MS ANALYZER*



The *SPECTRUM* softkey displays the spectrum of the WCDMA MS signal with a span of 25 MHz in the analyzer mode.

This measurement gives an overview of the W-CDMA signal spectrum so that interfering signals in the immediate vicinity can be identified. Measurement settings, e.g. the span, can be modified as required for further signal measurements.

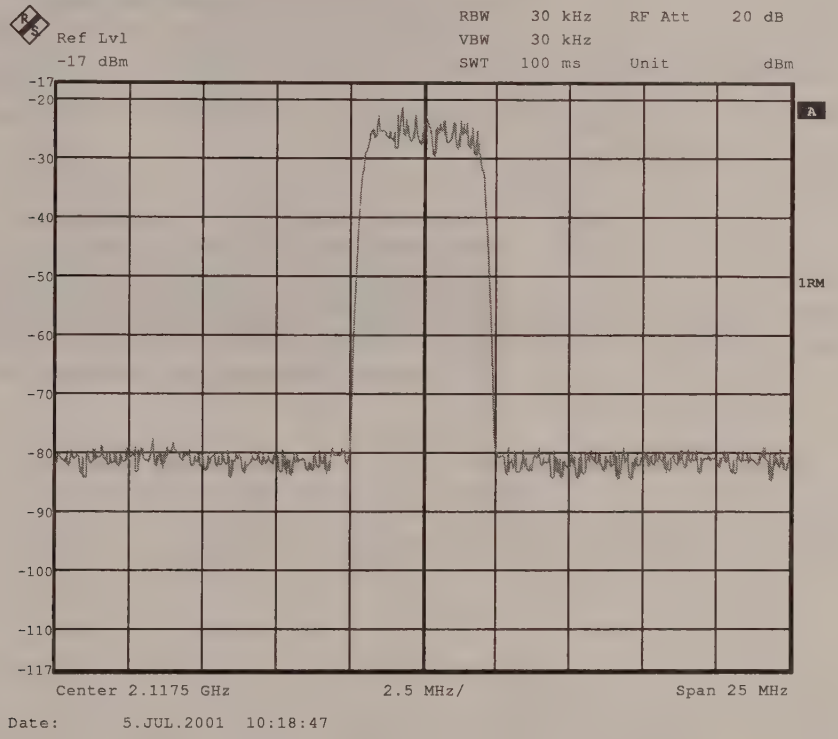


Fig. 6-5 Spectrum display of WCDMA signal at a 25 MHz span.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:		Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings
FREQUENCY SPAN		25 MHz
SWEEP SWEEP	SWEEP TIME MANUAL	0.1 sec
SWEEP COUPLING	RES BW MANUAL	30 kHz
TRACE 1	DETECTOR	RMS

Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement FDOMain`

Query of results: -- (visual evaluation)

Measurement of Crest Factor - TIME DOMAIN

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER*

The *TIME DOMAIN* softkey displays the CREST factor of the WCDMA MS signal in the analyzer mode.

For this measurement, a signal section is continuously recorded.
The W-CDMA signal is measured in the zero span in the time domain. The result is displayed in two traces.
Trace 1 is measured with the sample detector. The analyzer calculates the average power from the displayed trace points.
Trace 2 is measured with the peak detector in the max. hold mode, i.e. the peak value of the signal is displayed.
The analyzer calculates the crest factor from the difference between the peak and the average power and displays it in the Marker Info field.

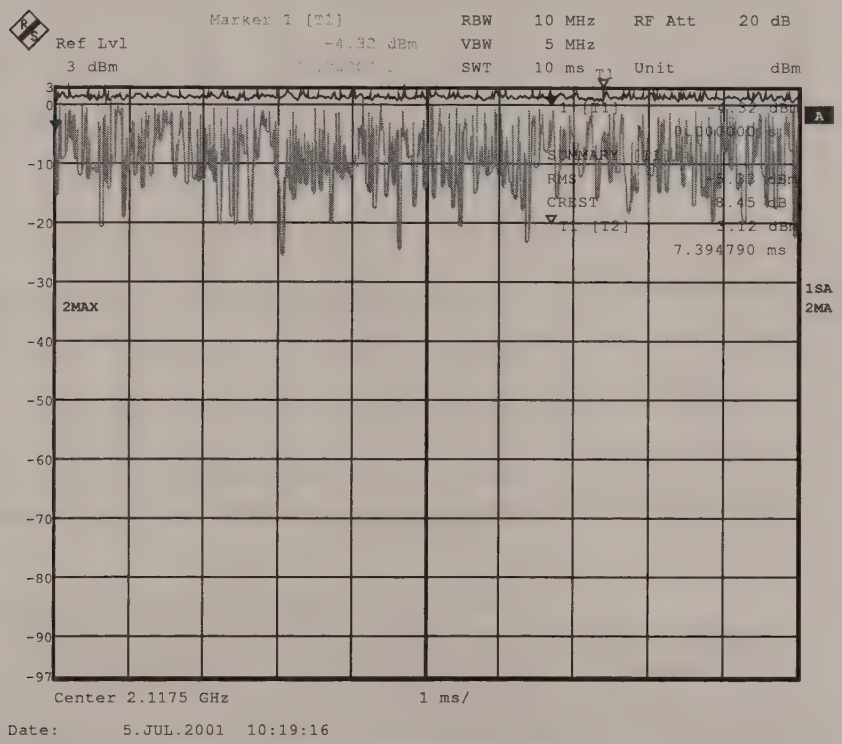


Fig. 6-6 Time domain display of WCDMA signal.

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained: Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings		
FREQUENCY SPAN		ZERO SPAN
SWEEP SWEEP	SWEEP TIME MANUAL	0.1 sec
SWEEP COUPLING	RES BW MANUAL	10 MHz
	VIDEO BW MANUAL	5 MHz
TRACE 1	DETECTOR	SAMPLE
MARKER NORMAL		MARKER 1
TRACE 2		MAX HOLD
TRACE 2	DETECTOR	MAX PEAK
MARKER SEARCH	SUMMARY MARKER	ON
MARKER SEARCH	SUMMARY MARKER	RMS
MARKER NORMAL	MARKER INFO	ON

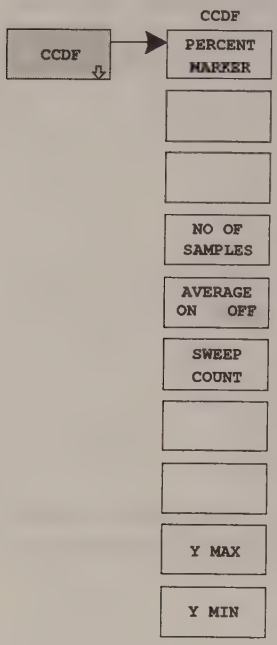
Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement TDOMain`

Query of results:
```
:CALCulate:MARKer:FUNCtion:CRESt?
:CALCulate:MARKer:FUNCtion:SUMMary:RMS:RESult?
:CALCulate:MARKer:FUNCtion:SUMMary:STATe ON
```

Signal Statistics - CCDF

CONFIGURATION - MODE - 3GPP MS ANALYZER submenu



The CCDF softkey starts a measurement of the distribution function of the signal amplitudes (complementary cumulative distribution function).

For the purposes of this measurement, a signal section of settable length is recorded continuously in the zero span, and the distribution of the signal amplitudes is evaluated. The record length and display range of the CCDF can be set using the softkeys of the menu. The amplitude distribution is displayed logarithmically as a percentage of the amount by which a particular level is exceeded, beginning with the average value of the signal amplitudes.

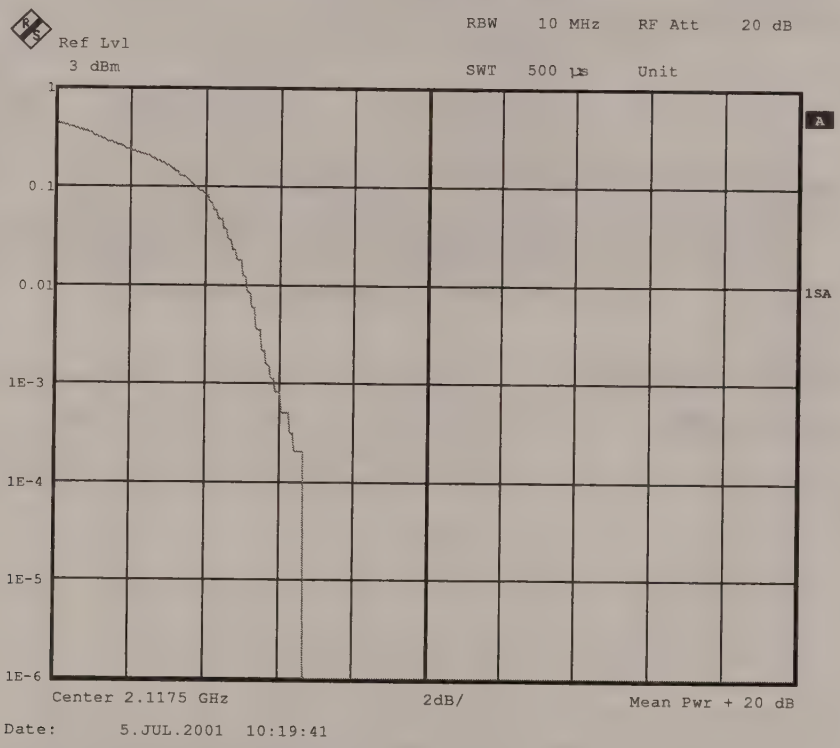


Fig. 6-7 CCDF of WCDMA signal

Pressing the softkey activates the analyzer mode with defined settings:

SYSTEM PRESET		
After Preset the following user-specific settings are restored and so the adaptation to the DUT is maintained:		Reference Level , Reference Level Offset Center Frequency, Frequency Offset Input Attenuation, Mixer Level All trigger settings
FREQUENCY SPAN		ZERO SPAN
TRACE1	DETECTOR	SAMPLE
SWEEP COUPLING	RES BW MANUAL	10 MHz
	VIDEO BW MANUAL	5 MHz

Starting from these settings, FSIQ can be operated in all functions available in the analyzer mode, i.e. all test parameters can be adapted to the requirements of the specific measurement.

IEC/IEEE-bus command: `:CONFigure:WCDPower:MS:MEASurement CCDF`
or
`:CALCulate:STATistics:MS:CCDF ON`

Query of results: `:CALCulate:MARKer:X?`

The *PERCENT MARKER* softkey sets the marker to the specified percentage of the Y axis. The step width of the marker movement depends on the current marker value.

In addition to this marker, the normal markers of the analyzer can be activated for the display mode.

IEC/IEEE-bus command: `:CALC:MARK:Y:PERC 5`

The *NO OF SAMPLES* softkey specifies the number of samples used to create the CCDF.

IEC/IEEE-bus command: `CALC:STAT:NSAM 5000`

The *AVERAGE ON / OFF* softkey specifies whether or not the results of continuous measurements (in conjunction with *SWEEP COUNT*) are averaged. The default setting of the softkey is *OFF*.

IEC/IEEE-bus command: `:DISP:TRAC1:MODE AVER | VIEW`

The *SWEEP COUNT* softkey determines the number of signal sections across which averaging is carried out (in the case of *AVERAGE ON*). Using *SWEEP COUNT* >1 and *AVERAGE ON*, the number of samples used to evaluate the statistical characteristics of the signal can be increased.

IEC/IEEE-bus command: `:SWE:COUN 6`

The *Y MAX* softkey specifies the upper limit of the display range of the CCDF. Since probabilities are specified on the Y axis, the entered numerical values are dimensionless. The maximum value of the softkey is 1.

IEC/IEEE-bus command: `CALC:STAT:SCAL:Y:UPP 0.01`

The *Y MIN* softkey specifies the lower limit of the display range of the CCDF. The minimum value of the softkey is 1E-6.

IEC/IEEE-bus command: `CALC:STAT:SCAL:Y:LOW 0.001`

Code Domain Measurements on WCDMA Signals

Application Firmware FSIQK73 provides the peak code domain error measurement, an EVM measurement of the total signal (modulation accuracy), prescribed by the 3GPP standard as well as the code domain power measurement of assigned and unassigned codes. In addition, the symbols demodulated in a slot, the decided bits or the EVM symbol can be displayed for an active channel.

A signal section of approx. 20 ms is recorded for analysis and searched for the start of a WCDMA frame. If a frame start is found in the signal, the CDP analysis is performed for a complete frame starting from slot 0.

Application firmware FSIQK73 offers two different ways of representing the code domain power measurement:

- Representation of all code channels

  Option FSIQK73 displays the power of all occupied code channels in a bargraph. Since, in the uplink, the channels are handled separately for the I and Q component, the display always applies to one of the two components. The x axis is scaled for the highest code class or the highest spreading factor (256). Code channels with a lower spreading factor occupy correspondingly more channels of the highest code class. The power of the code channel is always correctly measured in accordance with the actual power of the code channel. Unused code channels are assumed to belong to the highest code class and displayed accordingly. The displayed power of an unused code channel therefore corresponds to the power of a channel with the spreading factor 256 at the respective code position.
  To simplify identification, used and unused channels are displayed in different colours. Used channels are yellow, unused channels are blue.
  The measured power always refers to one slot. The start of slot 0 coincides with the beginning of the analyzed WCDMA frame.

- Representation of channel power versus slots of a WCDMA signal frame

  In this case the power of a selectable code channel is indicated versus a frame. The power is always measured within one slot of the selected channel. The start of slot 0 coincides with the beginning of the analyzed WCDMA frame.

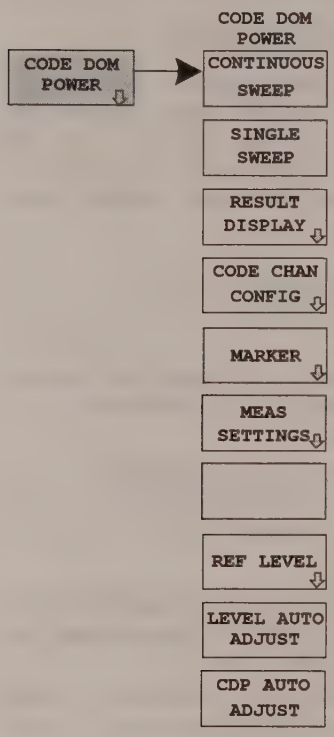
The measurements symbol constellation, symbol EVM and bit stream are each referred to one slot of the selected channel.
The modulation accuracy and peak code domain error measurements are always referred to the total signal.

For code domain power (CDP) measurements, the display is operated in the *SPLIT SCREEN* mode. In the upper section of the display, only CDP representations are permissible; in the lower section of the display, all other representations are permissible. An exception is the *CDP OVERVIEW* display mode in which CDP representations appear in both sections.

For code domain power measurements, the FSIQK73 expects that the Dedicated Physical Common Control Channel (DPCCH) is contained in the signal to be measured.

There are two modes for the CDP analysis. In the *CODE CHAN AUTOSEARCH* mode, FSIQK73 performs an automatic search for active channels in the whole code domain. The channel search is based on the power of the channels and on a signal/noise ratio that should not be exceeded within the channel. In the *CODE CHAN PREDEFINED* mode, the user can define the active channels contained in the signal via tables that can be selected and edited.

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER*



The *CODE DOM POWER* softkey activates the code domain measurement mode and opens a submenu for configuring the measurements.
All settings can be performed in these submenus.

IEC/IEEE-bus command:

```
:CONFigure:WCDPower:MS:MEASurement WCDPower
```

or:

```
:INSTrument:SELect MWCDpower
```

Query of results:

```
:TRACe:DATA?  TRACE1 | TRACE2 | ABITstream
```

or

```
:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDP:MS:RESult?
    PTOTal | FERRor |TFRame | MACCuracy |
    PCDerror | EVMRms | EVMPeak | CERRor |
    SRATe |CHANnel | CDPabsolute | CDPRelative |
    IQOFfset | IQIMbalance | CMAPping | PSYMbol
```

or

Marker functions (see MARKER submenu)

Continuous Measurement - Continuous Sweep

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*

The *CONTINUOUS SWEEP* softkey sets a continuous measurement mode. The start of the actual measurement, however, may depend on an external trigger. (see section Trigger Settings - TRIGGER Menu)

IEC/IEEE-bus command:

```
:INITiate:CONTinuous ON;
:INITiate:IMMediate
```

Single Measurement - Single Sweep

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*

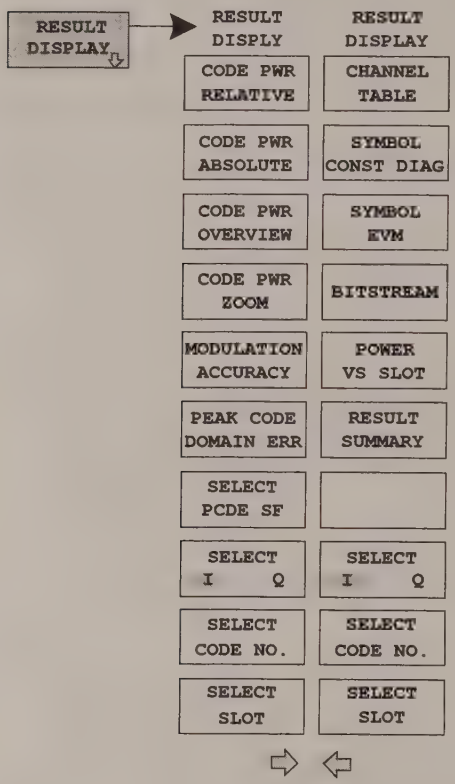
The *SINGLE SWEEP* softkey sets the single measurement mode. A single sweep is performed upon pressing the softkey. The start of the actual measurement, however, may depend on an external trigger (see section Key group SWEEP).

IEC/IEEE-bus command:

```
:INITiate:CONTinuous OFF;
:INITiate:IMMediate
```

Display Mode - RESULT DISPLAY

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*



The *RESULT DISPLAY* softkey opens a submenu for setting the display mode. The main menu contains the most important display modes as well as the measurements specified by the 3GPP standard for a fast access, whereas the side menu contains more detailed display modes.

The following display modes are available:

CODE PWR RELATIVE
: Code domain power with relative scaling (I or Q component)

CODE PWR ABSOLUTE
: Code domain power with absolute scaling (I or Q component)

CODE PWR OVERVIEW
: Code domain power with relative scaling (I and Q component simultaneously)

CODE PWR ZOOM
: Selection of 32 codes out of the 256 possible codes

MODULATION ACCURACY
: Square difference between test signal and ideal reference signal

PEAK CODE DOMAIN ERROR
: Projection of the error between the test signal and the ideal reference signal onto the various spreading factors and subsequent summation using the symbols of each difference signal slot

POWER VS SLOT
: Power of the selected channel versus all slots of a WCDMA signal frame

RESULT SUMMARY
: Tabular result display

CHANNEL TABLE
: Display of channel occupation table

SYMBOL CONST DIAG
: Display of constellation diagram

SYMBOL EVM
: Display of error vector magnitude diagram

BITSTREAM
: Display of decided bits

For the display modes *CODE PWR RELATIVE / ABSOLUTE / OVERVIEW / ZOOM, POWER VS SLOT, SYMBOL CONST DIAG / EVM and BITSTREAM*, the displayed component can be selected via the *SELECT I / Q* softkey.

By entering a code number (*SELECT CODE NO:* softkey) in the modes *CODE PWR RELATIVE /ABSOLUTE / ZOOM, POWER VS SLOT, SYMBOL CONST DIAG / EVM, BITSTREAM* it is possible to mark a channel for more detailed display modes.

The desired spreading factor can be selected with the *SELECT PCDE SF* softkey in the *PEAK CODE DOMAIN* display mode.

In the *POWER VS SLOT, SYMBOL CONST DIAG* and *SYMBOL EVM* display modes a slot can be marked by entering a slot number using the *SELECT SLOT* softkey.

Above the diagram, the most important measurement settings which form the basis if the display modes are summarized:

```
CF      2.1175 GHz  SR      960 ksps
Code Pwr Relative   Chan Code     1
Slot Number     5   Mapping      Q
```

Fig. 6-8 Indication of measurement parameters

The different elements are:
1st column:

CF 2.1175 GHz:	Center frequency of signal
Code Pwr Relative:	Name of selected display mode
Slot Number 5:	Slot number (value of SELECT SLOT softkey)

2nd column:

SR 960 ksps:	Symbol rate of selected channel
Chan Code 1:	Spreading code of selected channel
Mapping Q	I/Q component onto which the channel is mapped

Note: *For the peak code domain error display mode, the indication of the symbol rate is replaced by the indication of the spreading factor onto which the error is projected (see PEAK CODE DOMAIN ERR softkey)*

The *CODE PWR RELATIVE* softkey selects the code domain power display mode with relative scaling.

The channel power refers to the total power of the signal.

The measurement interval for determining the channel power equals one slot. The reference value for the start of slot 0 is the beginning of the analyzed WCDMA frame.

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

In the *CODE CHAN AUTOSEARCH* mode, a data channel is designated as active if its power is increased by a minimum value (see softkey *INACT CHAN THRESH*) compared to the noise and if the a minimum signal/noise ratio is maintained within the channel.
In *CODE CHAN PREDEFINED* mode, each data channel that is included in the user defined channel table is considered to be active.

By entering a code channel number (see *SELECT CODE NO* softkey) it is possible to mark a channel for more detailed display modes. The marked channel is shown in red. The whole channel is marked if it is an assigned channels, and only the entered code is marked in the case of an unassigned code.
The display mode for the path of representation and the slot can be varied using the *SELECT I/Q* and *SELECT SLOT* softkeys.
Selecting other display modes (e.g. SYMBOL CONSTELLATION) for unassigned codes is possible but not useful since the results are not valid.

The figure shows the relative CDP representation of the Q path for 2 data channels that are active in this path.

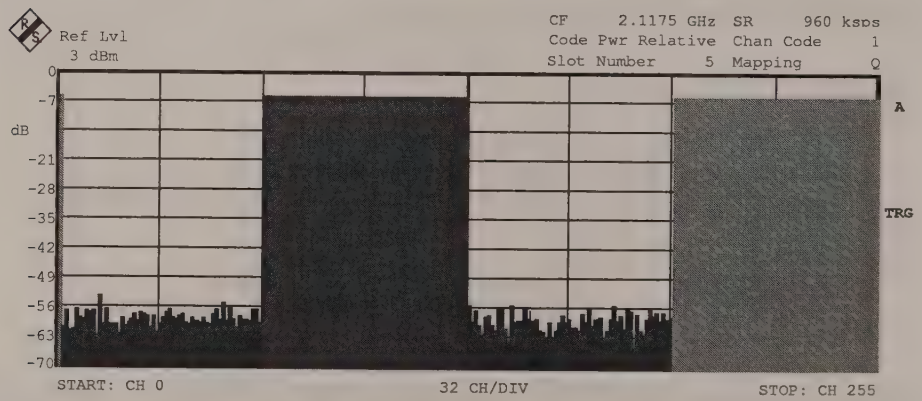
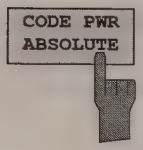


Fig. 6-9 CDP diagram (relative scaling)

IEC/IEEE-bus command: `:CALCulate<1>:FEED "XPOW:CDP:RAT"`



The *CODE PWR ABSOLUTE* softkey selects the code domain power display mode with absolute scaling.

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

After entering a code number (*SELECT CODE NO* softkey) it is possible to mark a channel for other display modes. The marked channel is shown in red.

The display mode for the path of representation and the slot can be varied using the *SELECT I/Q* and *SELECT SLOT* softkeys.
The measurement interval for determining the power of the channels is a slot. he reference value for the start of slot 0 is the beginning of the analyzed WCDMA frame.

For the recognition of the active code channels, the conditions are the same as those described for *CODE PWR RELATIVE*.

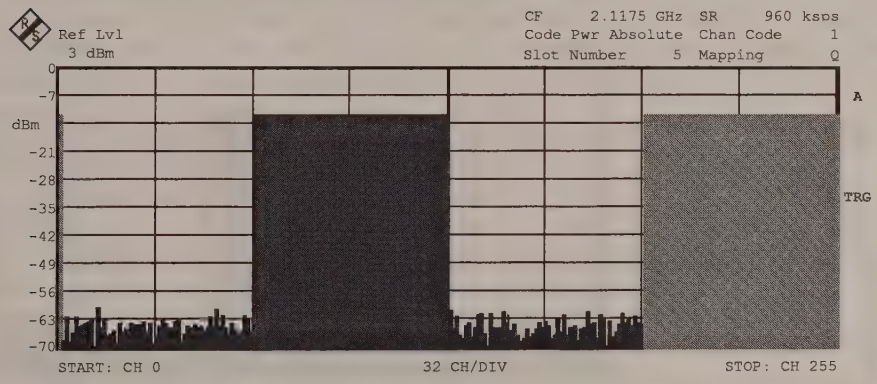
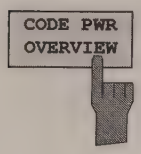


Fig. 6-10 Code domain power display mode with absolute scaling

IEC/IEEE-bus command: `:CALCulate<1>:FEED "XPOW:CDP"`



The *CODE PWR OVERVIEW* softkey displays the code domain power of the two components of the I/Q plane simultaneously. This display provides an overview of the channels contained in the signal. The display mode can be varied for different slots of the signal using the *SELECT SLOT* softkey.

The conditions described under *CODE PWR RELATIVE* apply to the identification of active code channels.

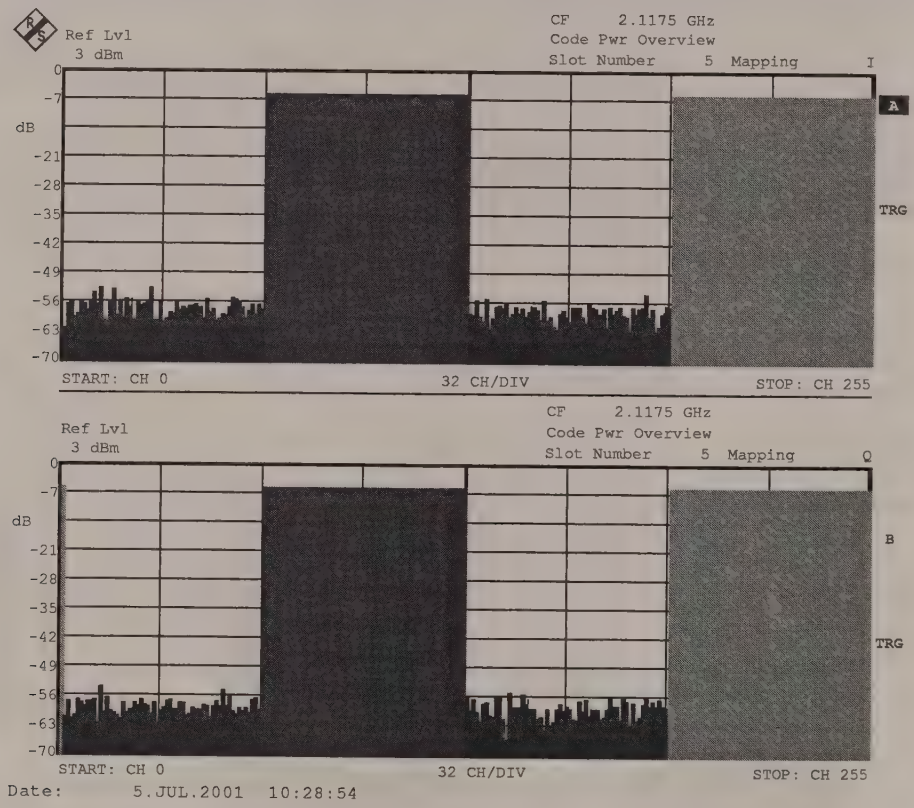


Fig. 6-11 Overview display

IEC/IEEE-bus command: `:CALCulate<1>:FEED "XPOW:CDP:OVERview"`

The *CODE PWR ZOOM* softkey zooms the x- axis of the code domain power display. The analyzer displays a window of 32 codes out of the 256 possible codes.

The representation is referred to the position of an activated marker. If no marker is active, the zoomed representation starts from code 0.

The powers of the active channels and of the unassigned codes are shown in different colours:

- yellow: active channels
- blue: unassigned codes

By entering a code channel number (see *SELECT CODE NO* softkey) it is possible to mark a channel for more detailed display modes. The marked channel is shown in red.
In the zoomed representation, the marked channel need not be contained in the displayed picture section. The display does not scroll depending on the marked channel.

The display mode for the path of representation or for the slot can be varied using the *SELECT I/Q* and *SELECT SLOT* softkeys.
The measurement interval for determining the channel power equals one slot. The reference value for the start of slot 0 is the beginning of the analyzed WCDMA frame.

For the recognition of the active code channels, the conditions are the same as those described for CODE PWR RELATIVE.

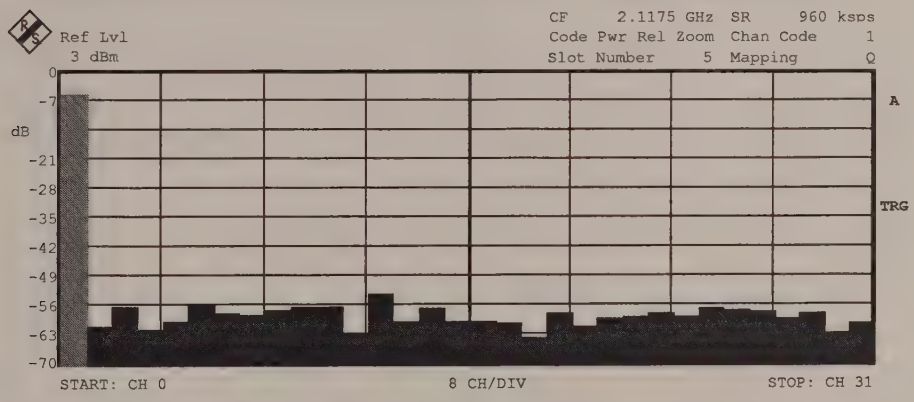


Fig. 6-12 Zoomed representation of the CDP diagram

IEC/IEEE-bus command: --

The *MODULATION ACCURACY* softkey selects the modulation accuracy display mode.

During the modulation accuracy measurement, the square root of the squared errors between the real and imaginary components of the test signal and an ideal reference signal (EVM referred to the total signal) is determined

Only the channels recognized as active are used to generate the ideal reference signal. If an assigned channel is not recognized as active, the difference between the measurement and reference signal, and the modulation accuracy is very high .

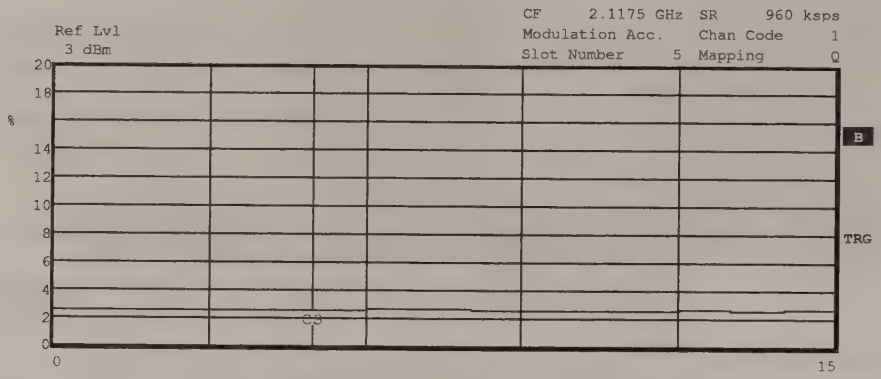


Fig. 6-13 Modulation Accuracy

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:MACCuracy"`

The *PEAK CODE DOMAIN ERROR* softkey selects the peak code domain error display mode.

In line with the 3GPP specifications, the error between the measurement signal and the ideal reference signal is projected onto the various spreading factors. The desired spreading factor is selected by means of the *SELECT PCDE SF* softkey.

The measurement interval for determining the channel power equals one slot. The reference value for the start of slot 0 is the beginning of the analyzed WCDMA frame.

Only the channels recognized as active are used to generate the ideal reference signal for the peak code domain error. If an assigned channel is not recognized as active, the difference between the measurement and reference signal is very high. FSIQK73 consequently indicates a peak code domain error that is too high.

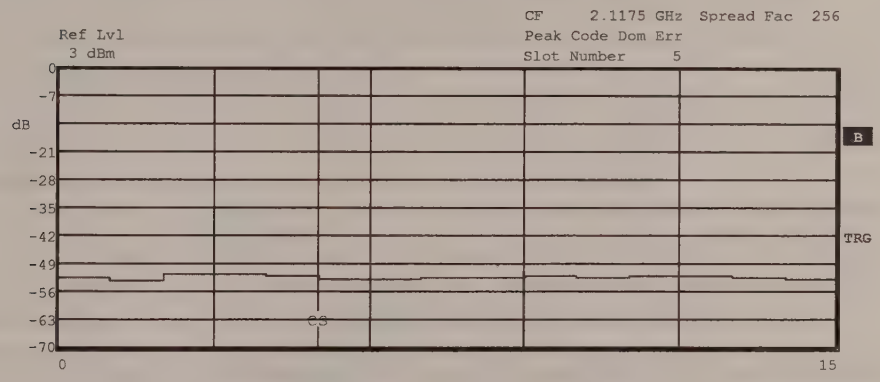
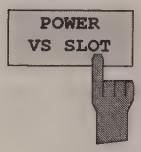


Fig. 6-14 Peak Code Domain Error

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:ERR:PCDomain"`



The *POWER VS SLOT* softkey selects the indication of the power of the selected code channel depending on the slot number. The power of the selected channel (marked red in the CDP diagram) is displayed versus all slots of a frame of the WCDMA signal.

Beginning with the start slot of the analysis, the power of 15 consecutive slots (corresponds to one WCDMA frame) of the signal is displayed. The representation is absolute.

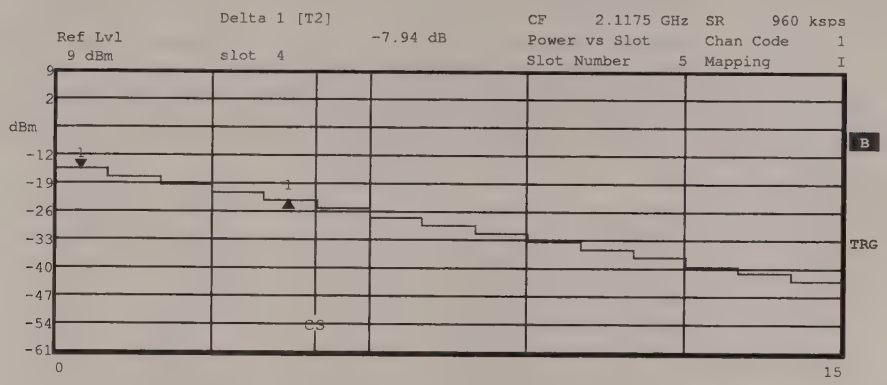


Fig. 6-15 Power versus Slot measurement for a channel with power control

It is not only possible to select a code channel in the CDP diagram, but also to mark a slot in the power-versus-slot diagram. Marking is done by entering the slot number (see *SELECT SLOT* softkey) and the selected slot is marked in red. The red marking is always on the starting point of a slot and can be varied only with the slot spacing (see vertical line CS in the figures above).

Modifying a slot number has the following effects:

- The CDP diagram in the upper half of the display is updated referred to the entered slot number.
- Starting from the slot, all dependent results are calculated for the selected channel. The relevant graphics are updated.

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:PVSLot"`

The *RESULT SUMMARY* softkey selects the numerical display of all results. The display is subdivided as follows:

```
                                    CF     2.1175 GHz  SR      960 ksps
Ref Lvl                             Result Summary     Chan Code     1
 3 dBm                              Slot Number     5  Mapping       Q
```

RESULT SUMMARY

GLOBAL RESULTS				
Total PWR	-6.28 dBm		Carr Freq Err	99.01 Hz
Chip Rate Err	-0.05 ppm		Trg to Frame	-90.61 ns
IQ Offset	0.56 %		IQ Imbalance	0.10 %
Modulation Acc	2.54 % rms		Pk Code Dom Err	-52.58 dB rms
No. of Pilot Symb	8			(15 ksps)
CHANNEL RESULTS				
Symb Rate	960 ksps		Slot Number	5
Channel Code	1		Chan Mapping	Q
Chan Pow rel.	-5.56 dB		Chan Pow abs.	-11.84 dBm
Error Vector Mag	1.93 % rms		Error Vector Mag	6.08 % Pk

B

TRG

Fig. 6-16 Result Summary

The upper part contains the results relating to the total signal:

Total PWR: Outputs the total signal power (average power of total evaluated WCDMA frame).

Carr Freq Err: Outputs the frequency error referred to the center frequency of the analyzer. The absolute frequency error is the sum of the analyzer and DUT frequency error.
Differences of more than 3 kHz between transmitter and receiver frequency impair the synchronization of the CDP measurement. For this reason, the transmitter and receiver should be synchronized (see chapter Getting Started).

Chip Rate Err: Outputs the chip rate error (3.84 Mcps) in ppm
As a result of a high chip rate error symbol errors arise and the CDP measurement is possibly not synchronized to the WCDMA signal. The result is valid even if the synchronization of analyzer and W-CDMA signal failed.

Trg to Frame: This result outputs the timing offset from the beginning of the recorded signal section to the start of the analyzed WCDMA frame. In the case of triggered data collection, this timing offset is identical with the timing offset of frame trigger (+ trigger offset) – frame start. In the case of failure of the synchronization of analyzer and W-CDMA signal, the value of Trg to Frame is not significant.

IQ Offset: DC offset of signals in %

IQ Imbalance: IQ imbalance of signal in %

Modulation Acc: The modulation accuracy is the difference between the test signal and the ideal reference signal (see *MODULATION ACCURACY* softkey). The rms average (of the analyzed frame) of the measurement results for each slot is given in the RESULT SUMMARY.

Pk Code Dom Err:
The *PEAK CODE DOMAIN ERROR* measurement specifies a projection of the difference between the test signal and the ideal reference signal onto the selected spreading factor (see *PEAK CODE DOMAIN ERR* and *SELECT PCDE SF* softkeys). The average (of the analyzed frame) of the measurement results for each slot is indicated in the RESULT SUMMARY as an overview. The spreading factor onto which projection is made is shown below the measurement result.

The results of measurements on the selected channel (red in the diagram) are displayed in the lower part of the RESULT SUMMARY.

Symb Rate: Symbol rate at which the channel is transmitted.

Slot Number: Number of slot for which the measurement is made (see *SELECT SLOT* softkey)

Channel Code: Number of the spreading code of the selected channel .

Chan Mapping: Component onto which the channel is mapped (I or Q)

Chan Pow rel. / abs.:
Channel relative (referred to CPICH) and absolute.

Error Vector Mag rms / Pk:
Average or peak of the results of the error vector magnitude measurement (see SYMBOL EVM softkey).

IEC/IEEE-bus command:

```
:CALCulate2:FEED "XTIM:CDP:ERR:SUMM"
:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDPower:MS:RESult?
     PTOTal | FERRor |TFRame  | MACCuracy |
     PCDerror | EVMRms | EVMPeak | CERRor |
     SRATe |CHANnel | CDPabsolute | CDPRelative |
     IQOFfset | IQIMbalance | CMAPping | PSYMbol
```

The *CHANNEL TABLE* softkey selects the display of the channel assignment table. The channel assignment table can contain a maximum of 256 entries, corresponding to the 256 assignable codes of the class with spreading factor 256.

The upper part of the table indicates the DPCCH that has to be present in the signal to be analyzed in the CDP measurement.

The lower part of the table indicates the data channels (DPDCH) contained in the signal. In accordance with the two channel configuration models stipulated by the standard, this list contains up to 6 data channels. The channels are listed in ascending order according to code numbers. Within a code number, the channel mapped onto the I component is entered first, followed by the channel mapped onto the Q component.

```
                                        CF     2.1175 GHz  SR      960 ksps
Ref Lvl                                 Channel Table      Chan Code     1
 3 dBm                                  Slot Number     5  Mapping       I
```

CHANNEL TABLE

Type	Symb R.	Code #	Status	Mapping	PWR ABS	PWR REL
DPCCH	15 ksps	0	active	Q	-11.78	-5.58
DPDCH	960 ksps	1	active	I	-11.77	-5.56
DPDCH	960 ksps	1	active	Q	-11.77	-5.57
DPDCH	960 ksps	3	active	I	-11.79	-5.58
DPDCH	960 ksps	3	active	Q	-11.77	-5.57
???	15 ksps	0	inactv	I	-68.79	-62.58
???	15 ksps	1	inactv	I	-67.10	-60.89
???	15 ksps	1	inactv	Q	-64.27	-58.07
???	15 ksps	2	inactv	I	-63.22	-57.02
???	15 ksps	2	inactv	Q	-62.55	-56.34
???	15 ksps	3	inactv	I	-67.38	-61.17

B

TRG

Fig. 6-17 Channel Table

The following parameters of these channels are determined by the CDP measurement:

Symbol Rate: Symbol rate at which the channel is transmitted (15 ksps to 960 ksps).

Code #: Number of channel spreading code (0 to [spreading factor - 1])

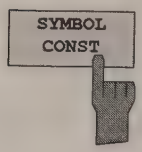
Status: Indication of status. All channels identified as active by the CDP analysis are entered in the table along with the symbol rate and the channel number. All other channels are inactive.

Mapping: Component onto which the channel is mapped (I or Q). The entry is not editable, since the standard specifies the channel assignment for each channel.

PWR ABS / PWR REL:
Indication of the absolute and relative channel power (referred to total power of signal).

In the *CODE CHAN AUTOSEARCH* mode, a data channel is designated as active if its power is increased by a minimum value (see softkey *INACT CHAN THRESH*) compared to the noise and if the a minimum signal/noise ratio is maintained within the channel.
In *CODE CHAN PREDEFINED* mode, each data channel that is included in the user defined channel table is considered to be active. In *CODE CHAN PREDEFINED* mode, all channels that are included in the user defined channel table are marked as active.

IEC/IEEE-bus command: `:CALCulate<1>:FEED "XTIM:CDP:ERR:CTABle"`



The *SYMBOL CONST DIAG* softkey selects the display of symbol constellation diagram .
The symbols are displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

In order to provide a better illustration of the constellation, the channel is entered in the diagram as if its constellation points would lie in the I/Q plane, i.e. channels that are mapped onto the I comonent have points on the real axis and channels mapped onto the Q component have points on the imaginary axis.

It is possible to display the symbol constellation for unassigned codes (red marking in the CDP diagram on a code represented in blue), but the results are not meaningful, as the unassigned code channel does not contain data.

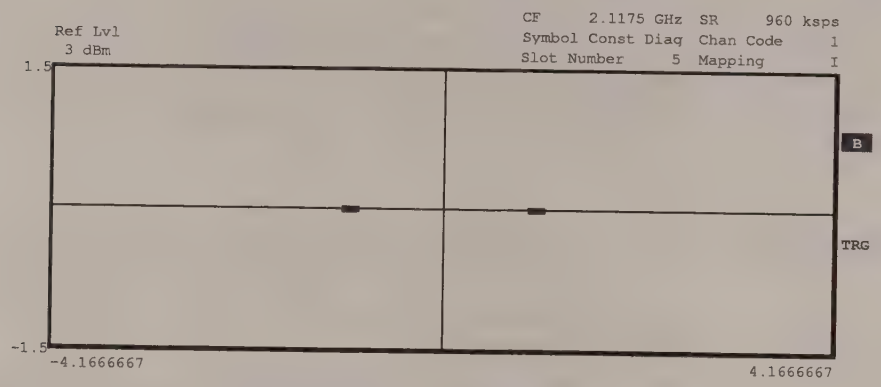


Fig. 6-18 Symbol Constellation Diagram, I mapping

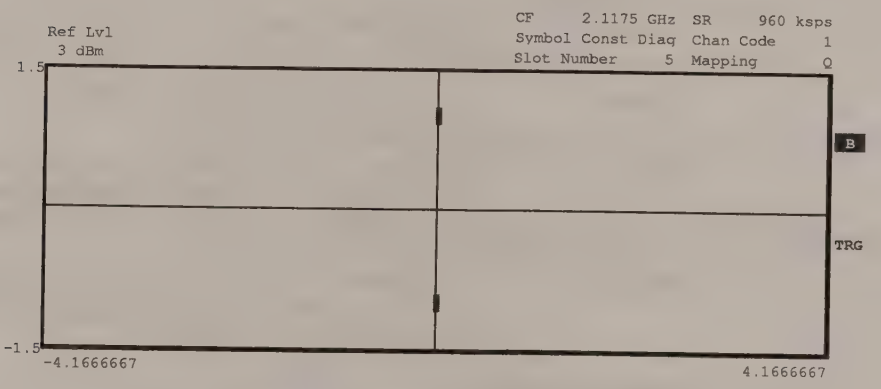
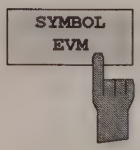


Fig. 6-19 Symbol Constellation Diagram, Q mapping

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:SYMB:CONS"`



The *SYMBOL EVM* softkey activates the symbol error vector magnitude display. The EVM is displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

It is possible to display the symbol error vector magnitude for unassigned codes (red marking in the CDP diagram on a code represented in blue), but the results are not valid.

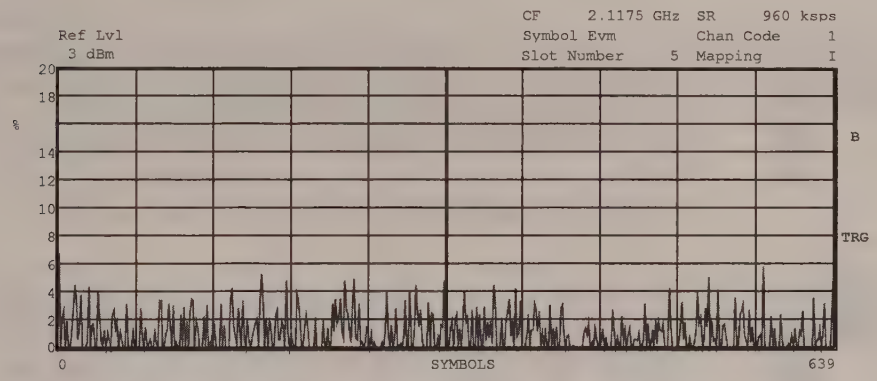


Fig. 6-20 Error Vector Magnitude for the selected slot of the selected channel

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:SYMB:EVM"`

The *BITSTREAM* softkey activates the bitstream display.
The decided bits are displayed for the selected channel (red marking in the CDP diagram) and the selected slot (red marking in the power-versus-slot diagram).

For unassigned codes, the representation of BITSTREAM can be selected. However, since the codes contain no data, the bits are characterized as invalid by a minus sign "-".

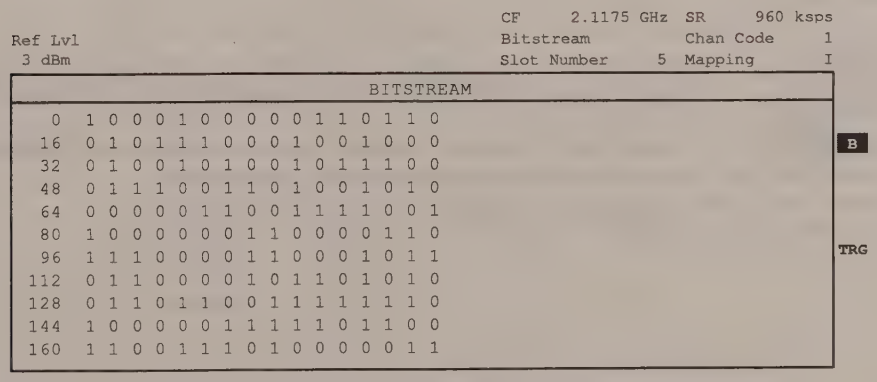


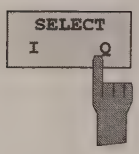
Fig. 6-21 Demodulated bits for the selected slot of the selected channel

IEC/IEEE-bus command: `:CALCulate2:FEED "XTIM:CDP:BSTReam"`

The *SELECT PCDE SF* softkey activates the entry of the class of codes onto which the error vector is to be projected for the *PEAK CODE DOMAIN ERROR* display. The entry of the spreading factor is only possible for this display mode, it has no effect on any other display mode.

IEC/IEEE-bus command:

```
:[SENSe:]CDPower:SFACtor 4|8|16|32|64|128|256
```



The *SELECT I/Q* softkey switches the display modes *CDP PWR RELATIVE /ABSOLUTE*, *CODE PWR ZOOM*, *POWER VS SLOT*, *SYMBOL CONST*, *SYMBOL EVM* between indication of I and Q component. Only channels that are mapped onto the corresponding component are taken into account by the respective display modes.

IEC/IEEE-bus command: `:[SENSe:]CDPower:MAPPing Q`

The *SELECT CODE NO* softkey activates the selection of a channel for the display modes *CDP PWR RELATIVE/ABSOLUTE*, *CODE PWR ZOOM*, *POWER VS SLOT*, *SYMBOL CONST*, *SYMBOL EVM*.

The entry is made on the basis of the code class with spreading factor 256. The number of the spreading code which the required channel has at its actual transmission rate has to be converted into spreading factor 256. The entered code correlates with the channel marked in red in the CDP diagram.

If the entered code corresponds to an active channel, the whole associated channel is marked. If it corresponds to a gap between the channels, only the entered code is marked.
If the code number is modified using the rollkey, the red marking changes its position in the diagram only if the code number no longer belongs to the marked channel.

IEC/IEEE-bus command: `:[SENSe:]CDPower:CODE 0 to 255`

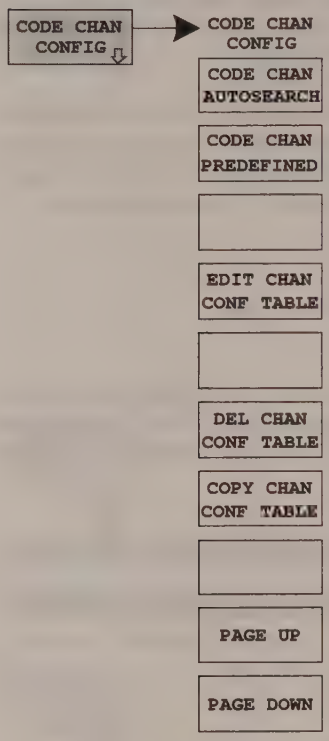
The *SELECT SLOT* softkey activates the selection of the slot number for the display modes *POWER VS SLOT*, *SYMBOL CONST*, *SYMBOL EVM*.

When the slot number is entered, the red marking in the power-versus-slot diagram changes its position in steps of 2560 chips.

IEC/IEEE-bus command: `:[SENSe:]CDPower:SLOT 0 to 14`

Measurement Configuration

CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE CHAN CONFIG sub menu



The *CODE CHAN CONFIG* softkey opens a submenu with different configurations for measurements. In this submenu, predefined channel tables can be selected and edited as a basis for code domain measurements.

When the softkey is selected, a table including the channel tables stored on the measuring instrument's hard disk is opened. The table provides just an overview and a table for the measurement can only be selected after actuating the *CODE CHAN PREDEFINED* softkey.

IEC-Bus-Befehl:

```
:CONFigure:WCDPower:MS:CTABle:CATalog?
```

The *CODE CHAN AUTOSEARCH* softkey allows code domain power measurements in the automatic search mode. In this mode, the whole code domain (all permissible symbol rates and channel numbers) is searched for active channels. Detecting an active channel is performed by a comparison of the channel power with the total power of the signal.

The *CODE CHAN AUTOSEARCH* mode is the preset search mode starting the CDP analysis. It is mainly intended for giving the user an overview of the channels contained in the signal. If the signal contains channels that are not detected as being active in the automatic search mode, the CDP analysis can be performed with the channel configurations predefined by the user by switching to the *CODE CHAN PREDEFINED* mode.

IEC/IEEE-bus command:

```
CONFigure:WCDPower:MS:CTABle[:STATe] OFF
```

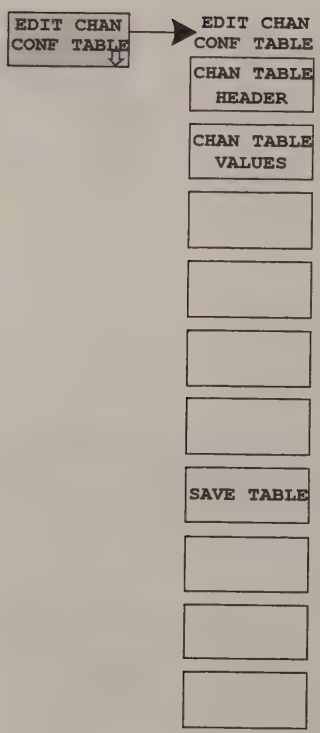
The *CODE CHAN PREDEFINED* softkey activates the predefined channel table mode. No search for active channels in the code domain is performed in this mode, but the channels contained in a channel table defined prior to the measurement are assumed to be active. The code domain power measurement and all further evaluations are carried out for these channels.

On selecting the softkey, a table containing all channel tables stored in the measuring instrument is opened. The CDP analysis is switched to the predefined channel table. When the next measurement is started, the power is measured according to this mode. The last table of the automatic search mode is first taken as a basis for the measurement. This table is available under the *RECENT* entry.

Switching to one of the predefined channel tables is done by selecting the corresponding table entry and pressing one of the unit keys. From the next measurement onwards, the selected channel table is taken as a basis for the sweep. The selected channel table is marked by a tick.

IEC/IEEE-bus command:

```
CONFigure:WCDPower:MS:CTABle[:STATe] ON
CONFigure:WCDPower:MS:CTABle:SELect "TEST"
```



The *EDIT CHAN CONF TABLE* softkey opens a submenu giving access to the softkeys required for editing the channel table. The channel table is opened simultaneously for editing. The user can modify the channel configuration in the selected channel table

EDIT CHANNEL TABLE

NAME: UL 1Chan

COMMENT: Table scanned on July 02 2001 at 14:30:02

DPCCH ACTIVE @15 ksps		PILOT LENGTH [bits] 8		
SYMB RATE [ksps]	CHAN#	MAPPING	CDP REL. [dB]	STATUS
960.0	1	I	-6.9	ACTIVE
960.0	1	Q	-7.0	INACTIVE
960.0	2	I	-6.9	INACTIVE
960.0	2	Q	-6.9	INACTIVE
960.0	3	I	-6.9	INACTIVE
960.0	3	Q	-6.9	INACTIVE

Fig. 6-22 Table for editing a channel configuration

It is possible to modify any of the channel tables stored in the instrument. The edited table is not stored automatically on the instrument hard disk but only after the *SAVE TABLE* softkey is activated. This prevents inadvertent overwriting of a table (e.g. one of the channel models).

If the table is edited that is currently taken as a basis for the CDP analysis, this table is used for the next measurement immediately after storage. The effects of modifications in the table are therefore visible at once. The edited table is stored on the instrument hard disk only after the *SAVE TABLE* softkey has been activated.

If the a table is edited that is stored on the instrument hard disk but currently not activated, the modifications are visible after storage (*SAVE TABLE* softkey) and subsequent activation.

The table structure for editing the channel configuration is based on the 3GPP specifications:
The FSIQK73 software distinguishes between the one data channel and multi-data channel configurations. The activation of a second data channel switches from the single-channel model to the multichannel model and vice versa. For the one data channel configuration, the entry *SYMBOL RATE* can be edited in the table. This editing function is not possible for several data channels. For several data channels, the numbering sequence of channel codes is prescribed. Therefore, the configuration is automatically adapted by the software when activating/deactivating the channels.

The *CHAN TABLE HEADER* softkey enables the user to edit the table header. The table name can be changed to prevent overwriting stored tables. The name of a table may not contain more than 8 characters.
The table header also includes editable entry PILOT LENGTH, which is gloabally processed for the total signal in the FSIQK73.

IEC/IEEE command:

```
:CONFigure:WCDPower:MS:CTABle:NAME "NEW_TAB"
```

The *CHAN TABLE VALUES* softkey enables the user to edit the entries in the channel table. The following entries are available for each channel contained in the table (entry is confirmed using the unit hardkeys):

SYMBOL RATE: Symbol rate at which the channel is transmitted. This entry can only be edited for channel configuration 1 with 1 data channel.

CHAN NO: Number of the channel in the associated transmission class. This entry can neither be edited for channels configuration 1 nore for channel configuration 2, as the channel numbers are defined in the standard for single channel and multi channel mode. In the case of single channel, the entry is adapted to the selected symbol rate

MAPPING: Component onto which the channel is mapped (I or Q). The entry is not editable, since the standard specifies the channel assignment for each channel.

CDP REL.: Information about the relative channel power. This entry cannot be edited and is only available for the *RECENT* table, it is used for detecting low-power channels.

STATUS: channel status (active/inactive). Modifying the channel status blanks out a channel entered in the table from the CDP analysis without the user having to clear the associated entry from the table. Only channels with an active channel status are used for the CDP analysis. Activating/deactivating channels switches between the single-channel model and the mutliple-channel model. In case of several channels, activating/deactivating channels automatically adapts the channel configuration according to the 3GPP specifications.

IEC/IEEE commands:

```
:CONFigure:WCDPower:MS:CTABle:DATA  8,4,1
:CONFigure:WCDPower:MS:CTABle:COMMent "Comment for
new table"
```

The *SAVE TABLE* softkey saves the table under the specified name.

IEC/IEEE command: -- (automatically executed in remote control)

The *DEL CHAN CONF TABLE* softkey deletes the selected table. In *CODE CHAN PREDEFINED* mode, the currently active table can not be deleted.

IEC/IEEE command:

```
:CONFigure:WCDPower:MS:CTABle:SELect "CTAB2"
:CONFigure:WCDPower:MS:CTABle:DELete
```

The *COPY CHAN CONF TABLE* softkey copies the selected table. The name for the copy is requested.

IEC/IEEE command:

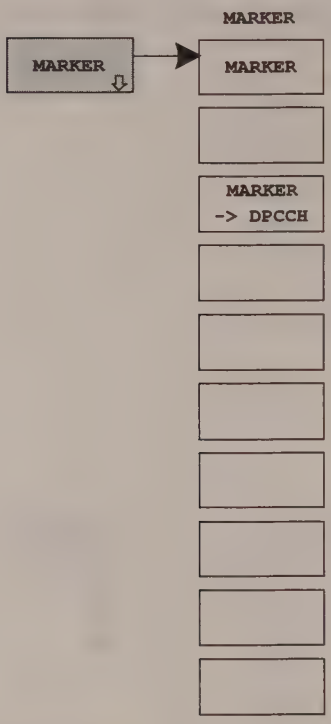
```
:CONFigure:WCDPower:MS:CTABle:SELect "CTAB2"
:CONFigure:WCDPower:MS:CTABle:COPY "NEW_CTAB"
```

The *PAGE UP* softkey is used to scroll through the selection table.

The *PAGE DOWN* softkey is used to scroll through the selection table.

MARKER Functions

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*



The *MARKER* softkey opens a submenu with the marker settings.

Markers are not available in the tabulated display modes *RESULT SUMMARY* and *CHANNEL TABLE.*

The parameters concerning an activated marker are output at the top of the diagram:

```
Marker 1 [T1]
                    -5.00 dB
slot 10 SR  30 ksps chan  23
```

Fig. 6-23 Parameters of the marker info field

For the channel assigned to the marker, the following channel parameters are indicated:

.... dB Channel power referred to the total power of the signal
Slot: Slot number of the channel (unassigned codes have a timing offset of 0 chip referred to beginning of the frame)
SR: Symbol rate of the channel (for unassigned codes 15 ksps)
Chan: Number of the spreading code of the channel

The *MARKER* softkey switches the marker on or off.

IEC/IEEE-bus commands:

```
:CALCulate<1|2>:MARKer<1>:STATe ON
:CALCulate<1|2>:MARKer<1>:X <channel_number>
:CALCulate<1|2>:MARKer<1>:Y?
```

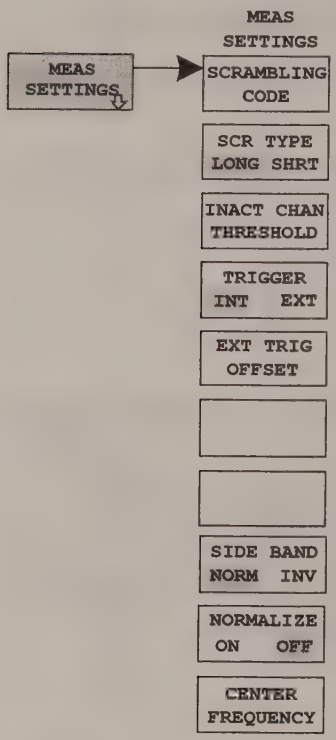
The *MARKER -> DPCCH* sets the marker to the Dedicated Physical Common Control Channel (code number 0 for component Q and spreading factor 256). This marker function is only available for CDP measurements of the Q component.

IEC/IEEE-bus commands:

```
:CALCulate<1|2>:MARKer<1>:FUNCtion:DPCCh
:CALCulate<1|2>:MARKer<1>:Y?
```

Configuration of CDP Measurement – MEAS SETTINGS

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*



The *MEAS SETTINGS* softkey opens a submenu with setting parameters for the CDP measurement.

The *SCRAMBLING CODE* softkey opens a window for entering the scrambling code. The scrambling code is input in hex format.

The entered scrambling code has to coincide with that of the signal. Otherwise a CDP measurement of the signal is not possible.

IEC/IEEE-bus command: `:[SENSe:]CDPower:LCODe[:VALue] #H2`

The *SCR TYPE LONG/SHRT* softkey determines whether the scrambling code entered (see softkey SCRAMBLING CODE) is to be handled as long or short scrambling code.

IEC/IEEE-bus command: `:[SENSe:]CDPower:LCODe:TYPE SHORt`

The *INACT CHAN THRESH* softkey activates the entry of the minimum power which a single channel should have as compared to the total signal in order to be considered an active channel.

Channels which are below the specified threshold are considered to be not active. Channels that are not active appear in blue colour in the CDP diagram.

The two measurements *MODULATION ACCURACY* and *PEAK CODE DOMAIN ERROR,* specified as measurements on the total signal, are performed with the aid of the list of active channels. These two measurements are falsified whenever active channels are recognized as not active (see above example) or if unassigned codes get the status "assigned channel". *INACT CHAN THRESHOLD* is therefore used to influence the results of the two measurements.

The default value is -10 dB. If not all channels in the signal are automatically detected with this setting, *INACT CHAN THRES* has to be incremented.

IEC/IEEE-bus command:

```
:[SENSe:]CDPower:ICTReshold -50dB to +10dB
```

The *TRIGGER INT EXT* softkey switches between internal (*FREE RUN*) and external triggering.

For internal triggering, at the beginning of the measurement a section (approx. 20 ms) of the signal, which must contain at least one frame of the WCDMA signal, is recorded and analyzed at a moment which cannot be determined by the user. The start of the next complete WCDMA frame is searched for in the recorded signal section and the signal is measured from this point.

In case of external triggering, FSIQK73 expects a trigger at the beginning of the WCDMA frame (frame trigger). There is no search for the beginning of the frame in the recorded signal section. The start of the WCDMA frame is only searched for within the first 2560 chips after the trigger event.
For external triggering the trigger output of the mobile station has to be connected to the FSIQ trigger input at the rear panel of the instrument.

Since with internal triggering the start of the next complete WCDMA frame is located in the middle of the recorded signal section (after approx. 10 ms) in the worst case, an external frame trigger reduces the search time for the frame start and consequently the computing time for the overall measurement.

IEC/IEEE-bus command:

```
:TRIGger[:SEQuence]:SOURce IMMediate|EXTernal
```

The *EXT TRG OFFSET* softkey activates the entry of the offset for external triggering (step width 40 ns).
The trigger offset can compensate for the shift of the frame trigger at the actual start of a frame. In the *RESULT DISPLAY* mode, the interval between the trigger event and the start of the WCDMA frame is indicated under "Trg to Frame". An offset of the trigger event influences the interval specified there.

If the trigger offset is set inadequately, the measurement may not be able to detect the start of a WCDMA frame in the search range. In this case, the measurement results are invalid and the code power of each channel is displayed in blue with almost the same level.

A modification of the trigger offset can influence the search range of FSIQK73 and thus secure the feasibility of the measurement.

IEC/IEEE-bus command: `:TRIGger:SEQuence:HOLDoff <num_value>`

The *SIDE BAND NORM / INV* softkey is used to perform the measurement both in the normal (NORM) and inverted position (INV).

NORM The normal position allows the measurement of RF signals from the mobile station.

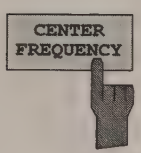
INV The inverted position is useful for measurements on IF modules or components in case of spectral inversion.

The default setting is INV.

IEC/IEEE-bus command: `:[SENSe:]CDPower:SBANd NORMal|INVers`

The *NORMALIZE ON / OFF* softkey eliminates the DC offset of the signal. Default setting is OFF.

IEC/IEEE-bus command : `[SENSe:]CDPower:NORMalize OFF`

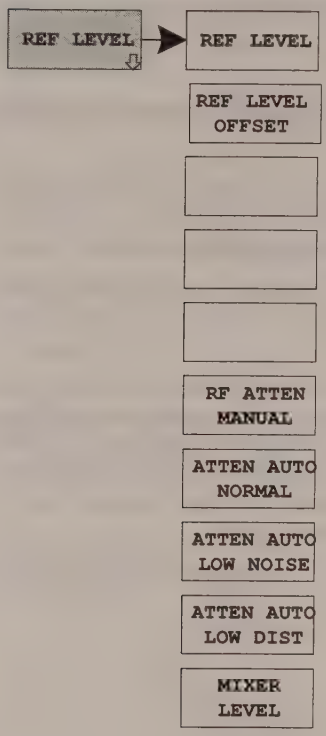


The *CENTER FREQUENCY* activates the input of the center frequency of the WCDMA signal.

IEC/IEEE-bus command: `:[SENSe:]FREQuency:CENTer 870.03 MHz`

Level Settings – REV LEVEL

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*



The *REF LEVEL* softkey opens a submenu for level setting.

The softkeys and their function are identical to the *REF LEVEL* menu in the basic unit and are described in the operating manual of the basic instrument.

Automatic Adaptation to Input Level - LEVEL AUTO ADJUST

Submenu: *CONFIGURATION- MODE – 3GPP MS ANALYZER – LEVEL AUTO ADJUST*

The *LEVEL AUTO ADJUST* softkey is used for automatically setting the RF attenuation and reference level to the level of the applied signal. Manual re-adjustment is permissible with the *REF LEVEL* softkey.

The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and reference level to optimum values independently of each other. This mode is maintained after changing from code-domain power measurements to the spectrum analyzer or vector signal analyzer mode.

IEC/IEEE-bus command: `:[SENSe:]CDPower:LEVel:ADJust`

Automatic Setting of CDP Measurement Mode - CDP AUTO ADJUST

Submenu: *CONFIGURATION - MODE - 3GPP MS ANALYZER - CODE DOM POWER*

The *CDP AUTO ADJUST* softkey automatically adapts the settings of the CDP measurement in such a way that a valid measurement on the signal is possible with high probability. For this purpose

- the following measurement parameters are set to predefined values:

Trigger:	FREE RUN
Marker / delta marker:	OFF
Code number:	0
Slot number:	0
Symbol rate:	15 ksps (referred to DPCCH)

- RF attenuation and reference level are set using *LEVEL AUTO ADJUST*
- a *SINGLE SWEEP* is carried out.

With these settings, the CDP measurement can be performed with high probability, provided a valid WCDMA signal to 3GPP is applied to the RF input of analyzer. The parameters *CENTER FREQUENCY, SCRAMBLING CODE, SCR TYPE LONG/SHORT* as well as an external reference for the measurement have to be manually adapted to the signal.

IEC/IEEE-bus command: `:[SENSe:]CDPower:PRESet`

TRACE Key Group

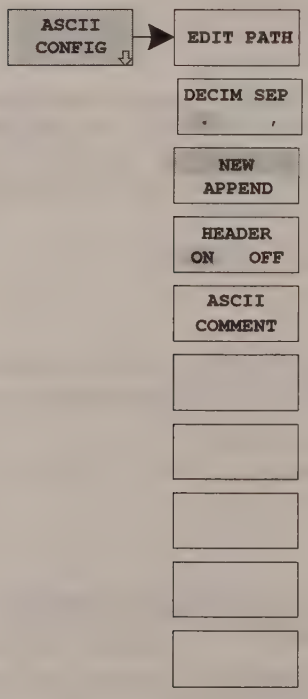
The *TRACE MATH* and *DETECTOR* settings are not available in the *TRACE* menu. The remaining softkeys are identical to those of the basic unit and are described in the FSIQ operating manual. The *DISPLAY MODE CDP* softkey opens the *RESULT DISPLAY* submenu of the CDP measurement mode.

Trace Settings - TRACE Key Group

The TRACE MATH settings are not available in the *TRACE* menu. The remaining softkeys are identical to those of the basic unit and are described in the FSIQ operating manual. The *DISPLAY MODE CDP* softkey opens the *RESULT DISPLAY* submenu of the CDP measurement mode.

The TRACE side menu contains the softkeys for ASCII trace export. These softkeys are used to store traces in a file so that the traces are available in a form that can be processed with mathematical programs.

The *ASCII EXPORT* softkey stores the corresponding trace in a file with ASCII format. The export function can be configured in the *ASCII CONFIG* submenu.



The *ASCII CONFIG* softkey calls a submenu for various settings for the *TRACE ASCII EXPORT* function.

The *EDIT PATH* softkey defines the directory in which the file is to be stored.

IEC/IEEE-bus command --

The *DECIM SEP* softkey selects the decimal separator for the ASCII file. The choice is '.' (decimal point) or ',' (comma).
This means that the decimal separator used in various language versions of evaluation programs (e.g. MS-Excel) can be selected so that the packages are supported. .

IEC/IEEE-bus command
`:FORMat:DEXPort:DSEParator POINt|COMMa`

The *APPEND NEW* softkey defines whether output data are to be written to an existing file or a new file.

- With *APPEND,* the data are added to an existing file.
- With *NEW,* either a new file is generated or an existing file is overwritten by storage of the data.

IEC/IEEE-bus command `:FORMat:DEXPort:APPend ON | OFF`

The *HEADER ON/OFF* softkey defines whether important instrument settings should be stored at the beginning of the file. The general device settings entered in the file header allow test results to be reproduced. A file header may impair data processing by mathematical programs.

IEC/IEEE-bus command `:FORMat:DEXPort:HEADer ON|OFF`

The *ASCII COMMENT* softkey activates the entry of commentary concerning the current ASCII data set. A total of 60 characters are available for this purpose.

IEC\IEEE bus command `:FORMat:DEXPort:COMMent 'string'`

In CDP measurement mode, the *ASCII EXPORT* softkey stores the corresponding trace in a file with ASCII format.

Upon pressing the ASCII EXPORT softkey, a file name can be entered. The default name is TRACE.DAT. Then the measured data of the trace are stored.

IEC-Bus-Befehl `:MMEMory:STORe:TRACe 1..4,<Pfad mit Filenamen>`

Structure of the ASCII file for CDPower measurements and measurements of signal spectrum:

The file consists of the header containing important scaling parameters and a data section containing the trace data. The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit

The data section starts with the keyword " Trace <n> " (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.
This format can be read in from spreadsheet calculation programs, eg MS-Excel. It is necessary to define ';' as a separator.

1) Format for CDP measurements

	Content of file	Description
File header	Type;FSIQ 7;	Instrument model
	Version;4.107;	Firmware version
	Date;26.Mar 2001;	Date record storage date
	Comment;ASCII-Darstellung;	Comment
	Mode;CDP;	Instrument operating mode
	Measurement;Code Domain Power;	Display mode (CDP, bitstream, ...)
	Digital Standard;WCDMA 3GPP REV;	Digital standard (3GPP REV, 3GPP FWD)
	Center Freq;2117500000.000000;Hz;	Center frequency
	Freq Offset;0.000000;Hz;	Frequency offset
	Ref. Level;-6.000000;dBm;	Reference level
	Level Offset;0.000000;dB;	Level offset
	RF Att;10.000000;dB;	Input attenuation
	y per div;2;dB;	Scaling of y axis per division
	Ref Value y-Axis;0;dB;	Scaling of y axis, reference value
	Ref Value Position;100.000000;%;	Scaling of y axis, position of reference value
	Sweep Count;0;	Number of sweeps set
	Spreading Factor;256;	Spreading factor
	Reference Slot;0;	Slot of the reference channel (identical to channel slot)
	Channel Slot;0;	Channel slot
	First Slot;0;	First slot
	Code Number;0;	Code number: 0 to 255
	Scrambling Code;0000H;	Scrambling code: 0000 to 1FFFH
	Scr Type;Long;	Scrambling type: : Long, Short, N/A
	Channel Threshold;10;	Channel threshold
	Invert Sideband;OFF;	Sideband normal, inverted; ON, OFF;
	Normalize;OFF;	Normalize;ON, OFF;
	Invert Q;OFF;	Invert Q;ON, OFF; N/A
Data section of the file (CDP abs / CDP rel / Channel Table)	TRACE 1:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	Values;238;	Number of data blocks / measurement values
	4;0;-13.643795;-3.643795;0;8;1;	<CodeClass>;<CodeNumber>;<yabs>;<yrel>;
	8;32;-41.409958;-31.409958;0;8;0;	<TimingOffset>;<PilotLength>;<Mapping>;
	8;33;-43.137810;-33.137810;0;8;0;	
	8;34;-35.651539;-25.651539;0;8;1;	Values <TimingOffset> and <PilotLength> are not relevant for FSIQK73.
	8;35;-41.930389;-31.930389;0;8;1;	
	8;36;-38.120872;-28.120872;0;8;1;	
	...	

Data section of the file (Result Summary)	Trace 2:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	3.135467;%;	Peak value Modulation Accuracy
	-52.303844;dB;	Peak value PCDE
	-9.127991;Hz;	Frequency error (carrier deviation)
	-5.221600;ppm;	Chip rate error
	-7.365761;dBm;	Total power of signal
	-122.502686;ms;	Trigger offset to frame start
	5.236792;%;	Peak value EVM
	2.605927;%;	RMS value EVM
	0.010436;%;	IQ offset
	0.938106;%;	IQ imbalance
	8;	Code class
	0;	Code number
	-2.310928;	Y absolute
	0.000000;	Y relative
	0.000000;	Timing offset (not relevant for FSIQK73, always 0)
	8;	Pilot length
	Q;	Mapping
Data section of the file (Power versus Slot / Peak Code Domain Error / Modulation Accuracy)	TRACE 2:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	Values;15;	Number of data blocks / measurement values
	0;16.843128;	<Slot>; <LevelValue>;
	1;0.554786;	
	2;11.818155;	
	3;15.885643;	
	....	
Data section of the file (Symbol Constellation)	TRACE 2:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	Values;10;	Number of data blocks / measurement values
	-0.293423;1.388842;	<LevelValue Real>;<LevelValue Imag>;
	0.038587;-0.735293;	
	0.961711;-1.217144;	
	2.015055;-0.696284;	
	....	
Data section of the file (Bitstream)	TRACE 2:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	Values;160;	Number of data blocks / measurement values
	1;0;1;0;0;1;1;0;1;0;	<Symbol>;
	0;0;1;1;1;1;1;1;1;0;	
	1;0;1;0;0;0;0;0;1;1;	
	0;1;1;0;1;1;1;1;0;1;	
	....	

Data section of the file (Symbol EVM)	TRACE 2:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: (CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD)
	Values;10;	Number of data blocks / measurement values
	5.288429;	<LevelValue>;
	1.950043;	
	3.740749;	
	2.073324;	
	....	

2) Format for Spectrum Emmission Mask measurements

	Content of file	**Description**
File header	Type;FSIQ 7;	Instrument model
	Version;4.107	Firmware version
	Date;26.Mar 2001;	Date record storage date
	Comment;ASCII-Darstellung;	Comment
	Mode;SEM;	Instrument operating mode
	Start;0.000000;Hz Stop;7000000000.000000;Hz	Start/stop of the display range. Unit: Hz for span > 0, s for span = 0,
	Center Freq; 2117500000.000000;Hz	Center frequency
	Span;7000000000.000000;Hz	Frequency range (0 Hz for zero span)
	Freq Offset;0.000000;Hz	Frequency offset
	x-Axis;LIN;	Scaling of x axis linear (LIN) or logarithmic (LOG)
	y-Axis;LOG;	Scaling of y axis linear (LIN) or logarithmic (LOG)
	Level Range;100.000000;dB	Display range in y direction. Unit: dB for x axis LOG, % for x axis LIN
	Ref. Level;-20.000000;dBm	Reference level
	Level Offset;0.000000;dBm	Level offset
	Max. Level;-20.000000;dBm	Maximium level
	RF Att;10.000000;dB	Input attenuation
	RBW;30000.000000;Hz	Resolution bandwidth
	VBW;300000.000000;Hz	Video bandwidth
	SWT;0.500000;s	Sweep time for one measurement
	Detector;RMS;	Detector set: AUTOPEAK, MAXPEAK, MINPEAK, AVERAGE, RMS, SAMPLE
	Sweep Count;0;	Number of sweeps set
	Channel Power; 0;	Channel power
	Limit Line; P>31;	Selected limit line
Data section of the file	TRACE 1:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD
	x-Unit;Hz;	Unit of x values: Hz for span > 0; s for span = 0; dBm/dB for statistics measurements
	y-Unit;dBm;	Unit of y values: dB*/V/A/W depending on the selected unit for y axis LOG or % for y axis LIN
	Values;500;	Number of measurement points
	6487500000.000000;-90.754356;	Measured values:
	6487550100.200400;-90.956367;	<x value>, <y1>, <y2>
	6487600200.400802;-90.655090;	<y2> being available only with AUTOPEAK detector and containing in this case the smaller of the two measured values for a measurement point.
	6487650300.601202;-91.537399;	
	...	

2) Format for CCDF measurements

	Content of file	Description
File header	Type;FSIQ 7;	Instrument model
	Version;4.10;	Firmware version
	Date;26.Mar 2001;	Date record storage date
	Comment;ASCII-Darstellung;	Comment
	Mode;CCDF;	Instrument operating mode
	Center Freq;2117500000.000000;Hz	Center frequency
	Freq Offset;0.000000;Hz	Frequency offset
	x-Axis;LIN;	Scaling of x axis linear (LIN) or logarithmic (LOG)
	Ref. Level;-20.000000;dBm	Reference level
	Level Offset;0.000000;dBm	Level offset
	RF Att;10.000000;dB	Input attenuation
	RBW;10000000.000000;Hz	Resolution bandwidth
	SWT;0.074000;s	Sweep time
	Detector;AUTOPEAK;	Detector set: AUTOPEAK, MAXPEAK, MINPEAK, AVERAGE, RMS, SAMPLE
	Sweep Count;0;	Number of sweeps set
	Sample Count;0;	Number of samples set
	y max;0;	Maximium level
	y min;0;	Minimium level
	Averaging;OFF;	Averaging ON/OFF
Data section of the file	TRACE 1:	Trace
	Trace Mode;CLR/WRITE;	Display mode of trace: CLR/WRITE, AVERAGE, MAXHOLD, INHOLD
	x-Unit;dB;	Unit of x values: Mean Pwr + ... dB;
	Values;500;	Number of measurement points
	0.000000;-12.450729;-106.249130	<x value>, <y1>, <y2>
	26052104.208417;-74.768776;-108.954018	<y2> being available only with AUTOPEAK detector and containing in this case the smaller of the two measured values for a measurement point.
	52104208.416834;-74.841995;-107.017891	
	78156312.625251;-74.569473;-103.686615	
	...	

Overview of Other Menus

SYSTEM Key Group

The *PRESET; CAL* and *INFO* menus in the code domain measurement mode are identical to the corresponding menus in the basic unit and are described in the FSIQ operating manual.

The parameters marked with grey are not available in the *DISPLAY* menu. The screen display is set to *SPLIT SCREEN* in the code domain measurement mode. The remaining softkeys are identical to those of the basic unit and are described in the FSIQ operating manual.

CONFIGURATION Key Group

The *MODE* menu enables selection of the mode. The analyzer, vector analyzer and tracking generator modes are described in the operating manual for the FSIQ basic unit. The code domain measurement mode is described in the present manual.

The *SETUP* menu in the code domain measurement mode is identical to the corresponding menu in the basic unit and is described in the FSIQ operating manual.

FREQUENCY Key Group

In the *CENTER* menu, the center frequency can be set for synchronization with the DUT and a frequency offset entered.

The *SPAN, START* and *STOP* keys have no function in the code domain measurement mode.

LEVEL Key Group, INPUT Key

The *REF, RANGE* and *INPUT* menus in the code domain measurement mode are identical to the corresponding menus in the basic unit and are described in the FSIQ operating manual.

MARKER Key Group

The *NORMAL* menu in the code domain measurement mode is identical to the *CONFIGURATION MODE – 3GPP MS ANALYZER – CODE DOM POWER* submenu.

The *DELTA* menu in the code domain measurement mode is identical to the corresponding menu in the vector analyzer mode and is described in the FSIQ operating manual.

The *SEARCH* and *MKR →* keys have no function in the code domain measurement mode.

LINES Key Group

The *LIMIT LINES* and *D-LINES* keys have no function in the code domain measurement mode.

SWEEP Key Group

The softkeys *FREE RUN, EXTERN, TRIGGER OFFSET* and *SLOPE POS/NEG* are available in the *TRIGGER* menu.

In the SWEEP menu only the parameters *SINGLE SWEEP* and *CONTINUOUS SWEEP* are available.

The *COUPLING* key has no function in the code domain measurement mode.

HCOPY and MEMORY Key Group

The *SETTINGS, RECALL* and *CONFIG* menus in the code-domain measurement mode are identical to the corresponding menus in the basic unit and are described in the FSIQ operating manual.

The *SAVE* menu offers the possibility to store the WCDMA channel tables. To this end, selection "WCDMA channel table" is included in the *ITEMS TO SAVE* selection list. The corresponding data set file has the extension *.ctm.

7 Remote-Control Commands

The following chapter describes the remote-control commands for the application firmware. An alphabetical list at the end of this chapter provides an overview of the commands.

The commands, which are also valid for the basic unit in the signal analyzer and vector signal analyzer modes as well as the system settings, are described in the operating manual of the analyzer.

CALCulate Subsystem

:CALCulate<1|2>:FEED <string>

This command selects the measured data that are to be displayed. .

Parameter: <string>::= 'XPOW:CDP' |
'XPOW:CDP:RAT' |
'XPOW:CDP:OVERview' |
'XTIM:CDP:MACCuracy' |
'XTIM:CDP:PVSLot' |
'XTIM:CDP:BSTReam' |
'XTIM:CDP:ERR:SUMM' |
'XTIM:CDP:ERR:CTABle' |
'XTIM:CDP:ERR:PCDomain' |
'XTIM:CDP:SYMB:CONStellation' |
'XTIM:CDP:SYMB:EVM'

Example: `":CALC2:FEED 'XTIM:CDP:MACCuracy'"`

Features: *RST value: 'XTIM:DDEM:MEAS' (vector signal analysis)
SCPI: conforming

Note: *For code domain power (CDP) measurements, the display is always operated in the SPLIT SCREEN mode and the assignment of display mode to measurement window is fixed. Therefore, the numeric suffix that is required or permitted is given in brackets for each display mode.*

The string parameters have the following meaning:

'XPOW:CDP'	Result display of code domain power as bargraph (`CALCulate<1>`)
'XPOW:CDP:RAT'	Result display of code domain power ratio as bargraph (`CALCulate<1>`)
'XPOW:CDP:OVERview'	overview, screen A displays CDP Rel I, screen B CDP Q
'XTIM:CDP:ERR:SUMM'	Result display in tabular form (`CALCulate2`)
'XTIM:CDP:ERR:CTABle'	Result display of channel assignment table (`CALCulate<1>`)
'XTIM:CDP:ERR:PCDomain'	Result display of peak code domain error (`CALCulate2`)
'XTIM:CDP:MACCuracy'	Result display of modulation accuracy (error vector magnitude referred to the overall signal) (`CALCulate2`)
'XTIM:CDP:PVSLot'	Result display of power versus slot (`CALCulate2`)
'XTIM:CDP:BSTReam'	Result display of bit stream (`CALCulate2`)
'XTIM:CDP:SYMB:CONStellation'	Result display of symbol constellation (`CALCulate2`)
'XTIM:CDP:SYMB:EVM'	Result display of symbol error vector magnitude (`CALCulate2`)

:CALCulate:LIMit:ESPectrum:MODE AUTO | USER

This command switches on or off the automatic selection of limit lines for spectrum emission mask measurements.

Parameter:
AUTO the set limit line depends on the measured channel power
USER only query possible, user-defined limit lines are switched on (see manual of instrument for description of limit line functions)

Example: ":CALC:LIM:ESP:MODE AUTO"

Features:
*RST value: AUTO
SCPI: device-specific

:CALCulate<1|2>:MARKer<1>:FUNCtion:DPCCh

This command sets the marker1 to channel 1.

Example: ":CALC:MARK:FUNC:DPCC"

Features:
*RST value: _
SCPI: device-specific

This command is an <Event> and has therefore neither *RST value nor query. Only the numeric suffix 1 is permissible in MARKer.

The numeric suffix in CALCulate that is required or permissible depends on the selected display mode for which the marker is to be valid and has to coincide with it:

CALCulate<1> for CDP absolute and relative

CALCulate2 for modulation accuracy, peak code domain error, power versus slot, bit stream, symbol constellation and EVM

CALCulate<1>:MARKer<1>:FUNCtion:CRESt?

Queries the Crest factor in the time domain measurement. Only the numeric suffix 1 is permissible in CALCulate and MARKer.

Example: "CALC:MARK:FUNC:CRES?"

Features:
*RST value: --
SCPI: device-specific

:CALCulate<1>:MARKer<1>:FUNCtion:WCDPower:MS:RESult? PTOTal | FERRor | TFRame | MACCuracy | PCDerror | EVMRms | EVMPeak | CERR or | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFfset | IQIMbalance | CMAPping | PSYMbol

This command queries the measured and calculated results of the WCDMA code domain power measurement.

Example: ":CALC:MARK:FUNC:WCDP:MS:RES? PTOT"

Features: *RST value: -
SCPI: device-specific

PTOTal	total power
FERRor	frequency error in Hz
TFRame	trigger to frame
MACCuracy	modulation accuracy
PCDerror	peak code domain error
EVMRms	error vector magnitude RMS
EVMPeak	error vector magnitude peak
CERRor	chip rate error
SRATe	symbol rate
CHANnel	channel number
CDPabsolute	channel power absolute
CDPRelative	channel power relative
IQOFfset	IQ offset
IQIMbalance	IQ imbalance
CMAPping	channel mapping
PSYMbol	no of pilot symbols

:CALCulate:MARKer:Y:PERCent 0 to 100%

This command positions the marker in CCDFmeasurements to the selected percent value of the y-axis scaling (probability)

Example: ":CALC:MARK:Y:PERC 40"

Features: *RST value: -
SCPI: device-specific

This command is an event which is why it is not assigned an *RST value and has no query.

CALCulate:STATistics - Subsystem

The CALCulate:STATistics subsystem controls the statistical measurement functions in the instrument. The measurement window cannot be selected with these functions. The numeric suffix in CALCulate is therefore ignored.

BEFEHL	PARAMETER	EINHEIT	KOMMENTAR
:CALCulate			
:STATistics			
:MS			
:CCDF			
[:STATe]	<Boolean>		
:NSAMples	<numeric_value>	--	
:SCALe			
:Y			
:UPPer	<numeric_value>	--	
:LOWer	<numeric_value>	--	

CALCulate:STATistics:MS:CCDF[:STATe] ON | OFF

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF).

Example: "CALC:STAT:MS:CCDF ON"

Features: *RST value: OFF
SCPI: device-specific

CALCulate:STATistics:NSAMples 100 to 32768

This command sets the number of measurement points to be acquired for the statistical measurement functions

Example: "CALC:STAT:NSAM 5000"

Features: *RST value: 10000
SCPI: device-specific

CALCulate:STATistics:SCALe:Y:UPPer 1E-5 to 1.0

This command defines the upper limit for the Y-axis of the diagram in statitistical measurements. Since probabilities are specified on the Y-axis, the entered numerical values are dimensionless.

Example: "CALC:STAT:SCAL:Y:UPP 0.01"

Features: *RST value: 1.0
SCPI: device-specific

CALCulate:STATistics:SCALe:Y:LOWer 1E-6 to 0.1

This command defines the lower limit for th Y-axis of the diagram in statistical measurements. Since probabilities are specified on the Y-axis, the entered numerical values are dimensionless.

Example: "CALC:STAT:SCAL:Y:LOW 0.001"

Features: *RST value: 1E-6
SCPI: device-specific

CONFigure:WCDPower Subsystem

This subsystem comprises the commands for configuring the code domain power measurements. Only the numeric suffix 1 is permissible in CONFigure.

CONFigure<1>:WCDPower:MS:MEASurement POWer | ACLR| ESPectrum | OBANdwith | OBWidth | WCDPower | FDOMain | TDOMain

This command selects the WCDMA mobile station tests. The settings of the predefined measurements are described for the associated softkey in chapter 6.

Parameter:	POWer	Channel power measurement (standard 3GPP WCDMA Forward) with predefined settings
	ACLR	Adjacent channel power measurement (standard 3GPP WCDMA Forward) with predefined settings
	ESPectrum	Measurement of spectrum emission mask
	OBANdwith | OBWidth	Measurement of occupied power bandwidth
	WCDPower	Code domain power measurement. This selection has the same effect as command INSTrument:SELect MWCDpower.
	FDOMain	Overview measurement in the frequency domain with predefined settings
	TDOMain	Measurement of crest factor in the time domain with predefined settings
	CCDF	Complementary Cumulative Distribution Function
Example:	"CONF:WCDP:MS:MEAS POW"	
Features:	*RST value:	POWer
	SCPI:	device-specific

CONFigure:WCDPower:MS:CTABle[:STATe] ON | OFF

This command switches the channel table on or off. On switching on, the measured channel table is stored under the name RECENT and switched on. After the RECENT channel table is switched on, another channel table can be selected with the command CONF:WCDP:MS:CTABle:SELect. The RECENT channel table must always be switched on first with the command CONF:WCDP:MS:CTABle:SELect and then the required channel table can be selected with the command CONF:WCDP:MS:CTABle:SELect

Example:	":CONF:WCDP:MS:CTAB ON"	
Features:	*RST value:	OFF
	SCPI:	device-specific

CONFigure:WCDPower:MS:CTABle:SELect <string>

This command selects a predefined channel table file. Before using this command, the RECENT channel table must be switched on first with the command CONF:WCDP:MS:CTABle.

Example:	":CONF:WCDP:MS:CTAB:SEL '3GB_1_32'"	
Features:	*RST value:	"RECENT"
	SCPI:	device-specific

:CONFigure:WCDPower:MS:CTABle:NAME <file_name>

This command selects an existing channel table or creates the name of a new channel table.

Example: ":CONF:WCDP:MS:CTAB:NAME 'NEW_TAB'"

Features: *RST value: "RECENT"
SCPI: device-specific

:CONFigure:WCDPower:MS:CTABle:DATA <numeric_value> ,<numeric_value>...

This command defines the values of the selected channel table:

<pilot length>,<code class>,<number of active channels>

Pilot length: pilot length of channel DPCCH
Code class: code class of channel 1. I-mapped
Number of active channels: 0 to 6

Prior to this command, the name of the channel table has to be defined with command CONF:WCDP:MS:CTAB:NAME.

The query **:CONFigure:WCDPower:MS:CTABle:DATA?** retrieves the following values:

<pilot length>,<code class>,<number of active channels>,<CDP relative 1>,<CDP relative 2>,<CDP relative 3>,<CDP relative 4>,<CDP relative 5>,<CDP relative 6>

Pilot length: pilot length of channel DPCCH
Code class: code class of channel 1. I-mapped
Number of active channels: 0 to 6
CDP relative 1: measured value of channel 1, I-mapped,
CDP relative 2: measured value of channel 1, Q-mapped,
CDP relative 3: measured value of channel 3, I-mapped,
CDP relative 4: measured value of channel 3, Q-mapped,
CDP relative 5: measured value of channel 2, I-mapped,
CDP relative 6: measured value of channel 2, Q-mapped,

Example: "CONF:WCDP:MS:CTAB:DATA 8,4,1"

Features: *RST value: -
SCPI: device-specific

:CONFigure:WCDPower:MS:CTABle:COMMent <string>

This command defines a comment for the selected channel table

Prior to this command, the name of the channel table has to be defined with command CONF:WCDP:MS:CTAB:NAME and the values of the table have to be defined with command CONF:WCDP:MS:CTAB:DATA.

Example: ":CONF:WCDP:MS:CTAB:COMM 'Comment for table 1'"

Features: *RST value: ""
SCPI: device-specific

:CONFigure:WCDPower:MS:CTABle:COPY <file_name>

This command copies one channel table onto another one. The channel table to be copied is selected with command `CONF:WCDP:MS:CTAB:NAME`.

Parameter: <file_name> ::= name of the new channel table

Example: `":CONF:WCDP:MS:CTAB:COPY 'CTAB_2'"`

Features: *RST value: --
SCPI: device-specific

The name of the channel table may contain a maximum of 8 characters. This command is an "event" which is why it is not assigned an *RST value and has no query.

:CONFigure:WCDPower:MS:CTABle:DELete

This command deletes the selected channel table. The channel table to be deleted is selected with command `CONF:WCDP:MS:CTAB:NAME`.

Example: `":CONF:WCDP:MS:CTAB:DEL"`

Features: *RST value: --
SCPI: device-specific

This command is an "event" which is why it is not assigned an *RST value and has no query.

:CONFigure:WCDPower:MS:CTABle:CATalog?

This command reads out the names of all channel tables stored on the harddisk.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,
<1st file name>,,<1st file length>,<2nd file name>,,<2nd file length>,....,<nth file name>,
<nth file length>

Example: `":CONF:WCDP:MS:CTAB:CAT?"`

Features: *RST value: --
SCPI: device-specific

INSTrument Subsystem

:INSTrument[:SELect] SANalyzer | DDEMod | ADEMod | BGSM | MSGM | CDPower | BWCDpower|WCDPower | **MWCDpower**

This command switches between the operating modes by means of text parameters.

Selection MWCDpower presets the instrument as described in Chapter 2, Section "Basic Settings in Code Domain Measurement Mode".

Example: `":INST MWCD"`

Features: *RST value: SANalyzer
SCPI: conforming

SENSe:CDPower Subsystem

This subsystem controls the parameters for the code domain mode. The numeric suffix in `SENSe<1|2>` is not significant in this subsystem.

:[SENSe:]CDPower:SFACtor 4 | 8 | 16 | 32 | 64 | 128 | 256

This command defines the spreading factor. The spreading factor is only significant for display mode PEAK CODE DOMAIN ERROR.

Example: `":CDP:SFACtor 16"`

Features: *RST value: 256
SCPI: device-specific

:[SENSe:]CDPower:CODE 0 to 255

This command sets the code number. The code number refers to code class 8 (spreading factor 256).

Example: `":CDP:CODE 30"`

Features: *RST value: 0
SCPI: device-specific

:[SENSe:]CDPower:MAPPing I | Q

This command defines the mapping of thes CDP signal.

Example: `":CDP:MAPP I"`

Features: *RST value: I
SCPI: device-specific

:[SENSe:]CDPower:NORMalize ON | OFF

This command switches normalization of the unit circle with the IQ offset on or off.

Example: `":CDP:NORM OFF"`

Features: *RST value: OFF
SCPI: device-specific

Mode: WCDP

:[SENSe:]CDPower:SLOT 0 to 14

This command sets the slot number.

Example: `":CDP:SLOT 3"`

Features: *RST value: 0
SCPI: device-specific

:[SENSe:]CDPower:PRESet

This command sets the parameters of the WCDMA measurement to predefined values (see softkey *CDP AUTO ADJUST* in chapter 6).

Example: ":CDP:PRES"

Features: *RST value: -
SCPI: device-specific

This command is an <Event> and has therefore neither *RST value nor query.

:[SENSe:]CDPower:SBANd NORMal | INVers

This command is for interchanging the left and the right sideband.

Example: ":CDP:CDP:SBAN INV"

Features: *RST value: INV
SCPI: device-specific

Mode: WCDP

:[SENSe:]CDPower:LCODe[:VALue] #H0 to #H1fff (hex)

This command defines the scrambling code in hexadecimal format.

Example: ":CDP:LCOD #H2"

Features: *RST value: 0
SCPI: device-specific

:[SENSe>:]CDPower:LCODe:TYPE LONG | SHORt

This command switches between long and short scrambling code.

Example: ":CDP:LCOD:TYPE SHOR"

Features: *RST value: LONG
SCPI: device-specific

:[SENSe:]CDPower:ICTReshold -50 dB to + 10 dB

This command sets the threshold value from which a channel is treated as active. The level entered refers to the total signal power.

Example: ":CDP:ICTR -10DB"

Features: *RST value: -10 dB
SCPI: device-specific

:[SENSe:]CDPower:LEVel:ADJust

This command is used for setting automatically the RF attenuation and IF gain to the level of the applied signal. The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and IF gain separately to optimum values. This mode is maintained after changing from code domain power measurements to the analyzer or vector analyzer modes.

Example: ":CDP:LEV:ADJ"

Features: *RST value: -
SCPI: device-specific

This command is an <Event> and has therefore neither *RST value nor query.

TRACe Subsystem

TRACe[:DATA] TRACE1 | TRACE2 | ABITstream

This command transfers trace data from the controller to the instrument, the query reads trace data out of the instrument.

Example:
```
":TRAC TRACE1,"+A$    (A$: data list in current format)
":TRAC? TRACE1"
```

Features: *RST value: -
SCPI: conforming

Only TRACE1, TRACE2 or ABITstream can be queried depending on the display mode.

ABITstream can be set only if `CALC2:FEED "XTIM:CDP:BSTReam"` is selected (in the lower bitstream window). This command returns the bitstreams of all 15 slots one after the other, the output format may be REAL, UINT or ASCIi.

For TRACE1 or TRACE2 the following measured values are transferred depending on the display mode:

CODE PWR ABSOLUTE / RELATIVE (TRACE1) , CHANNEL TABLE (TRACE2)

Each channel is defined by the class, the channel number, the absolute level, the relative level and the I/Q mapping. The class denotes the spreading factor of the channel.

Class 8 corresponds to the highest spreading factor (256, symbol rate 15 ksps), class 2 to the lowest admissible spreading factor (4, symbol rate 960 ksps).

Five values are transmitted for each channel.

< class>,<cannel number>,<absolute level>,<relative level>,<I/Q mapping>, ...

The units are:

Absolute level	dBm,
Relative level	dB referred to total power.
I/Q mapping	1 = I mapping; 0 = Q mapping

The example shows the results of a query for three assigned channels with the following configuration:

1st channel:	spreading factor 256, channel number 0, Q-mapped
2nd channel:	spreading factor 4, channel number 1, I-mapped
3rd channel:	spreading factor 4, channel number 1, Q-mapped

This yields the following result: 8,0,-40,-20,0,0,2,1,-40,-20,1,2,7,1,-40,-20,0,0

The channels come in the same order as in the CDP diagram, i.e. depending on their position in the code domain of spreading factor 256.

RESULT SUMMARY (TRACE2)

The results of the RESULT SUMMARY are output in the following order:

<modulation accuracy>,<peak CDE>,<carr freq Error>,<chip rate error>,
<total power>,<trg to frame>,<EVM peak channel>,<EVM mean channel>, <class>,
<channel number>,<power abs. channel>,<power rel. channel>,<I/Q mapping>,
<number of pilot symbols>, <IQ offset>,<IQ imbalance>

The units are:

EVM peak channel/mean channel, modulation accuracy, IQ offset/imbalance :	%,
Peak CDE, total power and power abs. channel	dB.
Power rel. Channel	dB referred to total signal power.
Carr freq error :	Hz
Chip Rate Error	ppm.
I/Q mapping	1 = I mapping; 0 = Q mapping
Pilot symbols	absolute
Trg to Frame	µs.

POWER VS SLOT (TRACE2)

15 pairs of slot and level values (for 15 slots) are always transferred.
<slot number>, <level value in dB>,<slot number>,<level value in dB>,.....

SYMBOL EVM (TRACE2)

The number of level values depends on the spreading factor:

Spreading factor 256	10 values
Spreading factor 128	20 values
Spreading factor 64	40 values
Spreading factor 32	80 values
Spreading factor 16	160 values
Spreading factor 8	320 values
Spreading factor 4	640 values

PEAK CODE DOMAIN ERR and MODULATION ACCURACY (TRACE2)

15 pairs of slot and level values are always transferred.
PEAK CODE DOMAIN ERR: <slot number>, <level value in dB>,.....
MODULATION ACCURACY: <slot number>, <level value in %>, ...

SYMBOL CONST (TRACE2)

The real and the imaginary part are transferred as a pair. Depending on the I/Q mapping either the real or the imaginary component is 0:
<re 0>,<im 0>,<re 1>,<im 1>,.....<re n>, <im n>

The number of level values depends on the spreading factor:

Spreading factor 256	10 values
Spreading factor 128	20 values
Spreading factor 64	40 values
Spreading factor 32	80 values
Spreading factor 16	160 values
Spreading factor 8	320 values
Spreading factor 4	640 values

BITSTREAM (TRACE2)

The bitstream of one slot is transferred. One value is transferred per symbol (range 0,1). The number of symbols is not constant and may vary for each sweep. Specific symbols in the bitstream may be invalid for unused channels. These invalid symbols are marked by "9".

Example for a bitstream trace: 0,1,0,0,1,1,0 (used channels) and 9,9,9,9,9,9,9,9,9,9 (unused channels.

Alphabetical List of Commands

Command	Parameter	Page
:CALCulate<1|2>:FEED	'XPOW:CDP' | 'XPOW:CDP:RAT' | 'XPOW:CDP:OVERview' | 'XTIM:CDP:MACCuracy' | 'XTIM:CDP:PVSLot' | 'XTIM:CDP:BSTReam' | 'XTIM:CDP:ERR:CTABle' | 'XTIM:CDP:ERR:SUMM' | 'XTIM:CDP:ERR:PCDomain' | 'XTIM:CDP:SYMB:CONStellation' | 'XTIM:CDP:SYMB:EVM'|	61
:CALCulate:LIMit:ESPectrum:MODE	AUTO | USER	62
:CALCulate<1>:MARKer<1>:FUNCtion:CRESt?		62
:CALCulate<1|2>:MARKer<1>:FUNCtion:DPCCh		62
:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDPower:MS:RESult?	PTOTal | FERRor | TFRame | MACCuracy | PCDerror | EVMRms | EVMPeak | CERRor | SRATe | CHANNel | CDPabsolute | CDPRelative | IQOFfset | IQIMbalance | CMAPing | PSYMbol	63
:CALCulate:MARKer:Y:PERCent	0 to 100%	63
:CALCulate:STATistics: SCALe:Y:LOWer	-1E-6 to 0.1	64
:CALCulate:STATistics:MS:CCDF[:STATe]	ON | OFF	64
:CALCulate:STATistics:NSAMples	100 to 32768	64
:CALCulate:STATistics:SCALe:Y:UPPer	-1E-5 to 1.0	64
:CONFigure<1>:WCDPower:MS:CTABle:CATAlog?		67
:CONFigure<1>:WCDPower:MS:CTABle:COMMent	<string>	66
:CONFigure<1>:WCDPower:MS:CTABle:COPY	<file_name>	67
:CONFigure<1>:WCDPower:MS:CTABle:DATA	<numeric_value>, <numeric_value>....	66
:CONFigure<1>:WCDPower:MS:CTABle:DELete		67
:CONFigure<1>:WCDPower:MS:CTABle:NAME	<file_name>	66
:CONFigure<1>:WCDPower:MS:CTABle:SELect	<string>	65
:CONFigure<1>:WCDPower:MS:CTABle[:STATe]	ON | OFF	65
:CONFigure<1>:WCDPower:MS:MEASurement	POWer | ACLR | ESPectrum | OBANdwidth|OBWidth | WCDPower | FDOMain | TDOMain	65
:INSTrument[:SELect]	MWCDpower	67
:[SENSe:] CDPower:SLOT	0 .to 14	68
:[SENSe:]CDPower:CODE	0 to 255	68
:[SENSe:]CDPower:ICTReshold	–50 to 10 dB	69
:[SENSe:]CDPower:LCODe:TYPE	LONG | SHORt	69
:[SENSe:]CDPower:LCODe[:VALue]	#H0 to #H1fff (hex)	69
:[SENSe:]CDPower:LEVel:ADJust		69
:[SENSe:]CDPower:MAPPing	I | Q	68
:[SENSe:]CDPower:NORMalize	ON | OFF	68
:[SENSe:]CDPower:PRESet		69
:[SENSe:]CDPower:SBANd	NORMal | INVers	69
:[SENSe:]CDPower:SFACtor	4 | 8 | 16 | 32 | 64 | 128 | 256	68
:TRACe[:DATA]	TRACE1| TRACE2 | ABITstream	70

Table of Softkeys with Assignment of IEC/IEEE Commands

CONFIGURATION Key Group

MODE

3GPP MS ANALYZER

```
:INSTrument:SELect MWCDpower
```

POWER

```
:CONFigure<1>:WCDPower:MS:MEASurement POWer
```

Query of results: `:CALCulate<1>:MARKer<1>:FUNCtion:POWer:RESult? CPOWer`

ACLR

```
:CONFigure<1>:WCDPower:MS:MEASurement ACLR
```

Query of results: `:CALCulate<1>:MARKer<1>:FUNCtion:POWer:RESult? ACPower`

SPECTRUM EM MASK

```
:CONFigure:WCDPower:MS:MEASurement ESPectrum
```

Query of results:: `:CALCulate<1>:LIMit<1>:FAIL?`

LIMIT LINE AUTO

```
:CALCulate<1>:LIMit<1>:ESPectrum:MODE AUTO
```

LIMIT LINE USER

```
:CALCulate:LIMit<1>:NAME <string>
:CALCulate:LIMit<1>:UNIT DBM
:CALCulate:LIMit<1>:CONTrol[:DATA] <num_value>, <num_value>, ...
:CALCulate:LIMit<1>:CONTrol:DOMain FREQuency
:CALCulate:LIMit<1>:CONTrol:TRACe 1
:CALCulate:LIMit<1>:CONTrol:OFFset <num_value>
:CALCulate:LIMit<1>:CONTrol:MODE   RELative

:CALCulate:LIMit<1>:UPPer[:DATA] <num_value>, <num_value>..
:CALCulate:LIMit<1>:UPPer:STATe   ON | OFF
:CALCulate:LIMit<1>:UPPer:OFFset <num_value>
:CALCulate:LIMit<1>:UPPer:MARGin <num_value>
:CALCulate:LIMit<1>:UPPer:MODE  ABSolute
:CALCulate:LIMit<1>:UPPer:SPACing LINear
```

Notes:

- If the y values are entered using the command:`CALCulate:LIMit<1>:LOWer[:DATA]` the limit check yields "failed" if the values are below the limit line.
- If a user-defined limit line is activated, it has priority over limit lines selected via AUTO.

OCCUPIED BANDWIDTH

```
:CONFigure<1>:WCDPower:MS:MEASurement OBANdwidth
```

Query of results: `:CALCulate<1>:MARKer<1>:FUNCtion:POWer:RESult? OBANdwidth`

SPECTRUM

```
:CONFigure<1>:WCDPower:MS:MEASurement FDOMain
```

Query of results: -- (visual evaluation)

TIME DOMAIN

```
:CONFigure<1>:WCDPower:MS:MEASurement TDOMain
```

Query of results:
```
:CALCulate<1>:MARKer<1>:FUNCtion:CRESt?
:CALCulate<1>:MARKer<1>:FUNCtion:SUMMary:RMS:RESult?
:CALCulate<1>:MARKer<1>:FUNCtion:SUMMary[:STATe] ON
```

CCDF

```
:CONFigure:WCDPower:MS:MEASurement CCDF     or
:CALCulate:STATistics:MS:CCDF[:STATe] ON
```

Query of results: `CALCulate:MARKer:X?`

PERCENT MARKER

```
:CALCulate:MARKer:Y:PERCent 0 to 100%
```

NO OF SAMPLES

```
:CALCulate:STATistics:NSAMamples 1 to 32768
```

AVERAGE ON OFF

```
:DISPlay[:WINDow]:TRACe1:MODE AVERage | VIEW
```

SWEEP COUNT

```
:[SENSe:]:SWEep:COUNt 6
```

Y MAX

```
:CALCulate:STATistics:SCALe:Y:UPPer 1E-5 to 1
```

Y MIN

```
:CALCulate:STATistics:SCALe:Y:LOWer 1E-6 to 0.1
```

CODE DOM POWER

```
:INSTrument<1>[:SELect] MWCDpower
```
or
```
:CONFigure:WCDPower:MS:MEASurement WCDPower
```

Query of results:

```
:TRACe:DATA? TRACE1 | TRACE2 | ABITstream
```

or

```
:CALCulate<1|2>:MARKer<1>:FUNCtion:WCDPower:MS:RESult?
        PTOTal | FERRor | TFRame | MACCuracy | PCDerror |
        VMRms | EVMPeak | CERRor | SRATe | CHANnel |
        CDPabsolute | CDPRelative | IQOFfset | IQIMbalance |
        CMAPping | PSYMbol
```

or Marker functions (see MARKER submenu)

CONTINUOUS SWEEP

```
:INITiate<1>:CONTinuous ON; INITiate<1>[:IMMediate]
```

SINGLE SWEEP

```
:INITiate<1>:CONTinuous OFF; INITiate<1>[:IMMediate]
```

RESULT DISPLAY

```
--
```

CODE PWR RELATIVE

```
:CALCulate<1>:FEED  'XPOW:CDP:RAT'
```

CODE PWR ABSOLUTE

```
:CALCulate<1>:FEED  'XPOW:CDP'
```

CODE PWR OVERVIEW

```
:CALCulate<1>:FEED  'XPOW:CDP:OVERview'
```

CODE PWR ZOOM

```
--
```

MODULATION ACCURACY

```
:CALCulate2:FEED "XTIM:CDP:MACCuracy"
```

PEAK CODE DOMAIN ERR

```
:CALCulate2:FEED "XTIM:CDP:ERR:PCDomain"
```

SELECT PCDE SF

```
:[SENSe:]CDPower:SFACtor 4 | 8 | 16 | 32 | 64 | 128 | 256
```

SELECT I Q

```
:[SENSe:]CDPower:MAPPing I | Q
```

SELECT CODE NO.

```
:[SENSe:]CDPower:CODE 0 to 255
```

SELECT SLOT	:[SENSe:]CDPower:SLOT 0 to 14
CHANNEL TABLE	:CALCulate<1>:FEED "XTIM:CDP:ERR:CTABle"
SYMBOL CONST DIAG	:CALCulate2:FEED "XTIM:CDP:SYMB:CONS"
SYMBOL EVM	:CALCulate2:FEED "XTIM:CDP:SYMB:EVM"
BITSTREAM	:CALCulate2:FEED "XTIM:CDP:SYMB:BITStream"
POWER VS SLOT	:CALCulate2:FEED "XTIM:CDP:PVSLot"
RESULT SUMMARY	:CALCulate2:FEED "XTIM:CDP:ERR:SUMM"
CODE CHAN CONFIG	--
CODE CHAN AUTOSEARCH	:CONFigure:WCDPower:MS:CTABle[:STATe] OFF
CODE CHAN PREDEFINED	:CONFigure:WCDPower:MS:CTABle[:STATe] ON :CONFigure:WCDPower:MS:CTABle:SELect <string>
EDIT CHAN CONF TAB	--
CHAN TABLE HEADER	:CONFigure:WCDPower:MS:CTABle:NAME "channel table name" :CONFigure:WCDPower:MS:CTABle:COMMent "Comment for new table"
CHAN TABLE VALUES	:CONFigure:WCDPower:MS:CTABle:NAME "channel table name" :CONFigure:WCDPower:MS:CTABle:DATA <numeric_value>
SAVE TABLE	-- (automatically executed in remote control with command CONFigure:WCDPower:CTABle:DATA)
DEL CHAN CONF TABLE	:CONFigure:WCDPower:MS:CTABle:NAME "channel table name" :CONFigure:WCDPower:MS:CTABle:DELete
COPY CHAN CONF TABLE	:CONFigure:WCDPower:MS:CTABle:NAME "channel table name" :CONFigure:WCDPower:MS:CTABle:COPY "new channel table name"
MARKER	--
MARKER	:CALCulate<1|2>:MARKer<1>[:STATe] ON | OFF; :CALCulate<1|2>:MARKer<1>:X <channel_number>; :CALCulate<1|2>:MARKer<1>:Y?
MARKER -> DPCCH	:CALCulate<1|2>:MARKer<1>:FUNCtion:DPCCh; :CALCulate<1|2>:MARKer<1>:Y?
MEAS SETTINGS	--
SCRAMBLING CODE	:[SENSe:]CDPower:LCODe[:VALue] #H0 to #H1fff (hex)>
SCR TYPE LONG SHRT	:[SENSe:]CDPower:LCODe:TYPE LONG | SHORt
INACT CHAN THRESH	:[SENSe:]CDPower:ICTReshold -50 dB ... +10 dB

TRIGGER INT EXT	:TRIGger[:SEQuence]:SOURce IMMediate | EXTernal
EXT TRG OFFSET	:TRIGger[:SEQuence]:HOLDoff <num_value>
SIDE BAND NORM INV	:[SENSe:]CDPower:SBANd NORMal | INVerse
NORMALIZE ON OFF	:[SENSe:]CDPower:NORMalize ON | OFF
CENTER FREQUENCY	:[SENSe:]FREQuency:CENTer <num_value>
REF LEVEL	--
REF LEVEL	:DISPlay[:WINDow<1|2>]:TRACe<1|2>:Y[:SCALe]:RLEVel <num_value>
REF LEVEL OFFSET	:DISPlay[:WINDow<1|2>]:TRACe<1|2>:Y[:SCALe]:RLEVel:OFFSet <num_value>
RF ATTEN MANUAL	:INPut<1|2>:ATTenuation <num_value>
ATTEN AUTO NORMAL	:INPut<1|2>:ATTenuation:AUTO:MODE NORMal; :INPut<1|2>:ATTenuation:AUTO ON
ATTEN AUTO LOW NOISE	:INPut<1|2>:ATTenuation:AUTO:MODE LNOise; :INPut<1|2>:ATTenuation:AUTO ON
ATTEN AUTO LOW DIST	:INPut<1|2>:ATTenuation:AUTO:MODE LDIStortion; :INPut<1|2>:ATTenuation:AUTO ON
MIXER LEVEL	:INPut<1|2>:MIXer <num_value>
LEVEL AUTO ADJUST	:[SENSe:]CDPower:LEVel:ADJust
CDP AUTO ADJUST	:[SENSe:]CDPower:PRESet

STATus QUEStionable:SYNC Register

This register comprises information about error status of the CDP measurements of application FSIQK72.
It can be queried with commands `STATus:QUEStionable:SYNC:CONDition?` and `"STATus :QUEStionable:SYNC[:EVENt]?`.

Table 7-1 Meaning of bits in STATus:QUEStionable:SYNC register

Bit No.	Meaning
0 to 6	not used in FSIQK73
7	**K73 Invalid trigger offset** This bit is set if a complete frame can not be processed due to the trigger settings.
8	**K73 Evaluation Error** This bit is set if an error that the subsequent bits do not describe in greater detail has occurred during the data evaluation for the code domain power analysis.
9	not used in FSIQK73
10	**K73 Frame sync failed** This bit is set if the synchronization to a frame was not possible.
11 to 14	not used in FSIQK73
15	This bit is always 0.

8 Performance Test

- Switch off FSIQ before removing or inserting modules.
- Check the setting of the AC supply voltage selector (230 V) prior to switching on the unit.
- Measure the parameters after a warm-up time of at least 30 min. and the completion of system error correction of FSIQ and SMIQ. Only then is it ensured that the specifications are complied with.
- Unless specified otherwise all settings are made after a PRESET.
- Conventions for settings on FSIQ during the measurement:

[***<Key>***]	Press a key on the front panel, eg [SPAN]
[<SOFTKEY>]	Press a softkey, eg [MARKER -> PEAK]
[<nn unit>]	Enter a value and terminate by entering the unit, eg [12 kHz]
{<nn>}	Enter values indicated in one of the following tables.

Successive entries are separated by [:], eg [***SPAN***: 15 kHz].

- The values stated hereinafter are not guaranteed values. Only the data sheet specifications are binding.

Required Measuring Equipment and Accessories

Table 8-1 Required Measuring Equipment and Accessories

Item	Instrument type	Recommended characteristics	Recommended equipment	R&S Order No.	Use
1	Signal generator	Vector signal generator for generating cdmaOne signals	SMIQ with options: SMIQB42 SMIQB20 SMIQB11	1125.5555.xx 1104.7936.02 1125.5190.02 1085.4502.04	

Test Procedure

The performance test refers exclusively to results of the code-domain power.
It is not required to check the POWER-, ACLR- and SPECTRUM results since they are covered by the performance test of the basic unit.

Default settings on SMIQ:

[PRESET]
[LEVEL : *0 dBm]*
[FREQ: *2.1175 GHz]*
DIGITAL STD
WCDMA 3GPP
LINK DIRECTION UP / REVERSE
TEST MODELS (NOT STANDARDIZED)...
C+D960K
SELECT BS/MS
MS 1 ON
*OVERALL SYMBOL RATE... 6*960*
POWER
STATE: ON

Trigger output: *RADIO FRAME*

Check set channels against the following table:

CHANNEL NUMBER	1	2	3	4	5	6
TYPE	DPDCH	DPDCH	DPDCH	DPDCH	DPDCH	DPDCH
SYMBOL RATE	960	960	960	960	960	960
CHAN CODE	1	1	3	3	2	2
DATA	PN15	PN15	PN15	PN15	PN15	PN15

Default settings on FSIQ:

[PRESET]
[CENTER: *2.1175 GHz]*
[REF: *10 dBm]*
[MODE: *3GPP MS ANALYZER: CODE DOM POWER*
MEAS SETTINGS *SCRAMBLING CODE 0*
SCR TYPE LONG
TRIGGER EXT
RESULT DISPLAY *CHANNEL TABLE*

Test setup and other settings

➢ Connect external trigger input of FSIQ to SMIQ

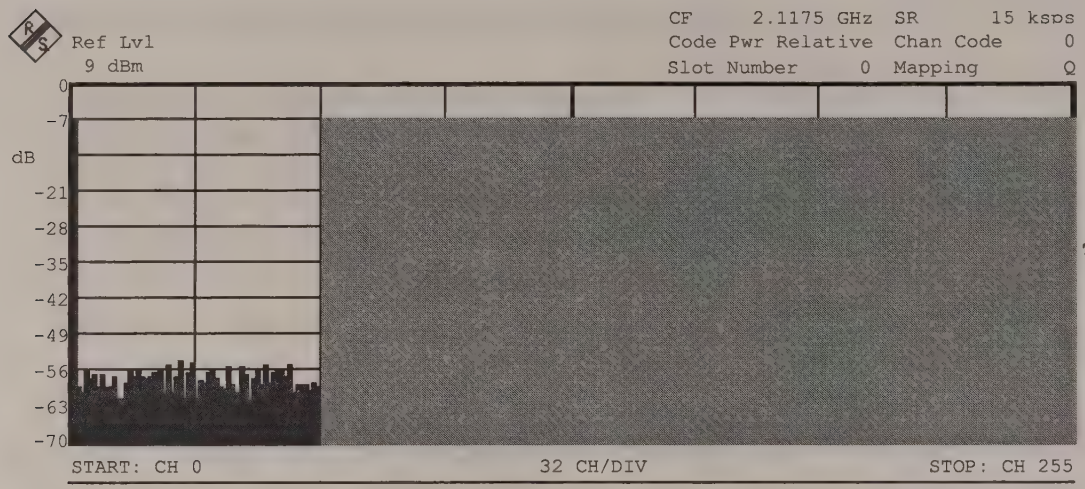
[TRIGGER: *TRIGGER OFFSET: 0µs]*

➢ Connect external reference output of FSIQ to SMIQ

SMIQ *UTILITIES*
REF OSC
SOURCE: EXT

FSIQ ***[SETUP:*** *REFERENCE INT]*

The display of the FSIQ should show the following:



Ref Lvl
9 dBm

CF 2.1175 GHz SR 15 ksps
Channel Table Chan Code 0
Slot Number 0 Mapping Q

CHANNEL TABLE

Type	Symb R.	Code #	Status	Mapping	PWR ABS	PWR REL
DPCCH	15 ksps	0	active	Q	-13.32	-6.99
DPDCH	960 ksps	1	active	Q	-13.32	-6.99
DPDCH	960 ksps	1	active	I	-13.33	-7.00
DPDCH	960 ksps	2	active	Q	-13.32	-7.00
DPDCH	960 ksps	2	active	I	-13.32	-6.99
DPDCH	960 ksps	3	active	Q	-13.31	-6.98
DPDCH	960 ksps	3	active	I	-13.32	-6.99
???	15 ksps	0	inactv	I	-66.68	-60.35
???	15 ksps	1	inactv	Q	-65.60	-59.27
???	15 ksps	1	inactv	I	-66.55	-60.22
???	15 ksps	2	inactv	Q	-66.98	-60.66

B

TRG

Date: 5.JUL.2001 10:56:56

➢ Transfer the measurement results indicated in the channel table to the performance test protocol.

Performance Test Report

Note: *The values specified in the data sheet are guaranteed limits. To these limits, the tolerances of the instruments used in the performance test must be added because of their measurement uncertainty.*

Table 8-2 Performance Test Report

Number pilot symbols: 8

Channel No.:	Type	Symbol rate	Channel No.:	Mapping
1	DPCCH	15	0	Q
2	DPDCH	960	1	I
3	DPDCH	960	1	Q
4	DPDCH	960	3	I
5	DPDCH	960	3	Q
6	DPDCH	960	2	I
7	DPDCH	960	2	Q

9 Glossary

Crest-Faktor	Ratio of peak to average value of the signal.
DPCCH	Dedicated Physical Control Channel, control channel. The channel is used in the FSIQK73 for the synchronization of the signal.
DPDCH	Dedicated physical data channel, data channel. The data channels which can be sent at different transmission rates are automatically recognized during the measurement.
Inactive Channel Threshold	Minimum power that a single channel must have as compared to the total signal to be recognized as an active channel
Modulation Accuracy	In accordance with the 3GPP specifications, the squared error between the real and imaginary parts of the test signal and an ideal reference signal is determined (EVM referred to the total signal) in a modulation accuracy measurement.
Peak Code Domain Error	In accordance with the 3GPP specifications, the error between the test signal and the ideal reference signal is projected onto the classes of the different spreading factors in the case of a peak code domain measurement.

10 Index

A

ACLR 17
ACP measurement 17
Adjacent-channel power 17
Automatic search mode 43
Automatic setting
  CDP measurement 52

B

Bandwidth
  occupied 20
Bitstream 41

C

Carr Freq Err 37
CCDF
  Contributive Cumulative Distribution Function 24
Center frequency 50, 59
Chan Pow rel. / abs 38
Channel assignment table 39
Channel Code 38
Channel table mode 44
Channel, active 49, 82
Chip Rate Err 37
Code # 39
Code domain measurements 27
Code domain power 30
Commands
  alphabetical list 72
  assignment to softkey 19, 73
  description 61
Crest factor 22

D

Dedicated Physical Common Control Channel 47
Default setting 3
Display range of CCDF 25
Distribution function of signal amplitudes 24

E

Error Vector Mag rms / Pk 38
External trigger 27

F

Frequency 50
  offset 59

K

Key
  CAL 59
  CENTER 59
  CONFIG 60
  COUPLING 60
  DELTA 59
  DISPLAY 59
  DLINES 59
  INFO 59
  INPUT 59
  LIMITS 59
  MKR TO 59
  MODE 15
  NORMAL 59
  PRESET 59
  RANGE 59
  RECALL 60
  REF 59
  SAVE 60
  SEARCH 59
  SETTINGS 60
  SETUP 59
  SPAN 59
  START 59
  STOP 59
  SWEEP 60
  TRACE 53
  TRIGGER 60

M

Marker 47
Menu overview 13
Mode
  channel table 44
  code domain 27
Modulation accuracy 34, 38

O

Offset, frequency 59

P

Peak code domain error 35
Performance Test 78
Pk Code Dom Err 38
Power
  adjacent-channel power 17
  channel power 16
Power measurement 16
Power of WCDMA signal 18
Predefined channel table mode 44
Preset 3
PWR ABS / PWR REL 39

S

Sample number 25
Scrambling code 48
Signal amplitudes, distribution function 24
Signal statistics 24
Slot 38, 42
Softkey
  3GPP MS ANALYZER 15, 67
  ACLR 17, 65
  APPEND NEW 54
  ASCII COMMENT 54
  ASCII CONFIG 53
  AVERAGE ON / OFF 25
  BITSTREAM 41, 61, 70
  CCDF 24, 64
  CDP AUTO ADJUST 52, 69
  CENTER FREQUENCY 50
  CHAN TABLE HEADER 45, 66
  CHAN TABLE VALUES 45, 66
  CHANNEL TABLE 39, 61, 70
  CODE CHAN AUTOSEARCH 43, 65
  CODE CHAN PREDEFINED 44, 65
  CODE DOM POWER 27

CODE PWR ABSOLUTE 31, 61, 70
CODE PWR OVERVIEW 32, 61
CODE PWR RELATIVE 30, 61, 70
CODE PWR ZOOM 33
CONTINUOUS SWEEP 27
COPY CHAN CONF TABLE 46, 67
DECIM SEP 54
DEL CHAN CONF TABLE 46, 67
EDIT CHAN CONF TABLE 44, 66
EDIT PATH 54
ENABLE OPTION 1
EXT TRG OFFSET 50
FREQUENCY 59
FREQUENCY OFFSET 59
HEADER ON/OFF 54
INACT CHAN THRESH 49, 69
LEVEL AUTO ADJUST 51, 69
LIMIT LINE AUTO 19, 62
LIMIT LINE USER 19, 62
MARKER 43, 47
MARKER -> DPCCH 47, 62
MEAS SETTINGS 48
MODULATION ACCURACY 34, 61, 65, 70
NEW CHAN TABLE 66
NO OF SAMPLES 25, 64
NORMALIZE ON/OFF 50, 68
OCCUPIED BANDWIDTH 20, 65
OPTIONS 1
PEAK CODE DOMAIN ERROR 35, 61, 70
PERCENT MARKER 25, 63
POWER 16, 65
POWER VS SLOT 36, 61, 70
REF LEVEL 51
RESULT DISPLAY 28, 61, 70
RESULT SUMMARY 37, 61, 70
SAVE TABLE 46
SCR TYPE LONG/SHRT 48, 69
SCRAMBLING CODE 48, 69
SELECT CODE NO 42, 68
SELECT I/Q 42, 68
SELECT PCDE SF 42, 68
SELECT SLOT 42, 68
SIDE BAND NORM / INV 50, 69
SINGLE SWEEP 27
SPECTRUM 21, 65
SPECTRUM EM MASK 18, 65
SWEEP COUNT 25
SYMBOL CONST 61, 70
SYMBOL CONST DIAG 40
SYMBOL EVM 41, 61, 70
TIME DOMAIN 22, 62, 65
TRIGGER INT EXT 49
Y MAX 25, 64
Y MIN 25, 64
Specifications 78
Spectrum 21
Spreading code 38
Spreading factor 42, 68
Status 39
Status register
STATus-QUEStionable-SYNC 77
Symb Rate 38
Symbol constellation 40
Symbol Error Vector Magnitude 41
Symbol Rate 39
Synchronization with the DUT 59

T

Test setup 10
Total PWR 37
Trg to Frame 37
Trigger 49

MP MASTER
MA20711